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THE GAS JOURNAL

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A Glance at the Contents—

Oil from Coal.

An extract is published of a paper on this subject by Mr. W. A. Joiner, M.Sc., A.I.C., before the Gas Institute of New Zealand. [p. 269.]

Gas Institute of New Zealand.

We give an extract of the Presidential Address of Mr. A. Couper, Engineer to the City of Dunedin Gas Department, at the seventh annual meeting of the Gas Institute of New Zealand. [p. 268.]

Wales and Monmouthshire Juniors' Summer Visit.

As in past years, the Wales and Monmouthshire Junior Gas Association arranged a summer visit, and this year took the opportunity of visiting the Coombs Wood Works of Messrs. Stewarts & Lloyds, Ltd.. at Halesowen, nr. Birmingham. [p. 270.]

Thermal Ratings for Domestic Appliances.

We publish to-day an article by Mr. R. D. Keillor, of Greenock, dealing with "a practical system of thermal rating for various pieces of domestic gas apparatus, which will be a welcome addition to the Gas Industry's armoury of competitive weapons." [p. 263.]

Landscape Lighting by Gas.

Lighting experiments of great interest were carried out on the evening of Tuesday of last week. They were in connection with the proposed scheme of lighting to celebrate the forthcoming International Illumination Congress, a portion of the proceedings at which will be staged in London next September. [p. 266.]

The New Bussey Retort.

A few weeks ago we published an article by Mr. Howard T. Wright describing recent improvements in the design of plant employed by the Bussey Coal Distillation Company, Ltd., at Glenboig. There has now been issued by the Department of Scientific Research a report by the Director of Fuel Research, Dr. C. H. Lander, on a test on this improved plant, which was carried out in November, 1930. [p. 262.]

Lamplighting Extraordinary.

A note is published of a peculiar method of lamplighting. "The lamplighter is mounted on a fleet horse, and, being provided with a rod, he keeps his steed galloping between the pillars, and when opposite one of them the docile animal suddenly stops so as to allow his rider to manipulate a lever handle attached to the lamp; and the flame being thus turned up or down as required, the lamplighter again 'urges on his wild career.'" [p. 264.]

New Gas Showrooms at Harrow.

A description is given in this issue of the first of the two new showrooms opened by the Gas Light and Coke Company last week. The opening ceremony was performed on July 21 by Mr. George H. Exeter (Chairman of the Harrow-on-the-Hill Urban District Council), who was accompanied by Mrs. Exeter, and was supported by Councillors and Principal Officers of the Local Councils. [p. 265.]

Electrification of Railway Main Lines.

At the annual luncheon of the Central Executive Board of the National Gas Council held on Monday last, important addresses were delivered by the Chairman (Sir David Milne-Watson, D.L., LL.D.) and Sir Arthur Duckham, K.C.B., G.B.E., upon the proposed scheme for the electrification of the main line railways of the country as outlined in the Report of the Committee presided over by Lord Weir. [p. 259.]

Coke Research in 1930.

On our "Reviews" page this week mention is made of the coke research work carried on by the Northern Coke Research Committee during 1930. The work of the Committee has continued to expand and progress. Early in 1930, the Committee decided to make a financial appeal to coke manufacturers of the district who had not then contributed directly to the cost of the researches, and the increased subscriptions have enabled the Committee to increase the scope of the work during the past year. [p. 262.]

Water Heating Tariffs.

Mr. J. H. Ranft, Engineer and Manager to the Lytham St. Annes Gas Department, comments on the article by "Engineer," on Water Heating, which appeared in the "JOURNAL" for July 8. "Engineer" made out a very strong case for the all-in charge for small thermal storage heaters, and justified it on a four-part tariff, with the proviso that the customer or service charge is already met by existing consumption. and the amount allowed for gas includes the cost into holder, *plus* manufacturing and distribution demands. [p. 255.]

Large Volume Water Heating.

Mr. C. H. Light, of the People's Gas Light and Coke Company, Chicago, believes that volume water heating offers one of the most desirable classes of business from the standpoint of the summer load. The office building, apartment house, bank, hospital, hotel, industrial plant, &c., constitute but a small list of the prospects to be found in any community. All of these and many others need and use hot water in large quantities, and, generally speaking, the cost of this hot water service with crude fuel is at its peak during the period when space heating is not required. [p. 271.]

EDITORIAL NOTES

£340,000,000

WHAT could not be done with such a sum as this? Far more, surely, than the most optimistic could hope to achieve through the electrification of the main line railways in Great Britain; and yet this is the object upon which it has been suggested that so huge an amount should be expended. A good deal has been said and written since its publication some time ago about what is known as the Weir Report, in which this course was recommended. But nothing we have seen or heard has presented the case for the fullest consideration of the proposal so convincingly as did Sir David Milne-Watson and Sir Arthur Duckham, speaking on Monday at the annual luncheon of the Central Executive Board of the National Gas Council; and to these authoritative statements Mr. William Cash added further well-reasoned comments. Even if the scheme were based upon the strongest foundations, there might well be hesitation in embarking upon such a stupendous outlay in times of financial difficulty like the present; how much more, then, should this be so when all we have to go upon are estimates which may be unrealized, and benefits which may prove illusory?

Immediately the report of the Committee was published, the National Gas Council had it examined, in order to ascertain its probable effect upon the Gas Industry. With what result? Sir David Milne-Watson tells us in the speech which will be found fully reported in this issue of the "JOURNAL:" "I regret to say that we found nothing in this report to justify any hope of our transport costs being reduced—nor, indeed, any prospect of any reduction in transport charges generally." It is, in fact, a fair assumption that, even if the estimated annual savings from electrification were realized, little could be spared for effecting any reduction in transport costs. And so far from it being a certainty, Sir David remarked that "the possible saving is extremely shadowy, and a very small error would turn this problematical saving into a definite loss." There is, of course, also the suggestion that some reduction in the cost of power to industry might result from the scheme, but who can imagine that industry would benefit by this means to anything like the extent needed to justify such an outlay?

One has merely to recall the extent to which estimates in connection with the original electricity grid scheme (which has so close a bearing upon the railway electrification proposals) have gone astray, to admit the justice of the demand that no definite steps should be taken to spend this vast sum of money, unless it can be proved up to the hilt that it is going to improve and cheapen railway transport. There was call for the publication of such a statement of the case as we are able to lay before our readers to-day, and we are indebted to the speakers referred to for the opportunity of doing so.

Oil from Coal

READERS will have enjoyed studying our report in last week's "JOURNAL" of the discussion on fuel subjects at the Jubilee Meeting of the Society of Chemical Industry. The views expressed by those who took part are fresh, and, besides throwing light on possible future developments, help to obviate confusion of thought regarding the production of oil from coal. It is obviously a national duty to assist the coal industry towards renewed prosperity, and all sorts of schemes towards this end are put forward periodically. It is unfortunate, particularly at the present time, that these schemes are pounced upon by politicians who hope by their advocacy to catch the ear of the voter. To our mind the salvation of the coal industry can never be a matter of Party politics. It is unfortunate, too, that writers in the Daily Press seize upon a particular aspect of a complex technical problem, and explain to their readers that this one aspect is a panacea to the ills from which the coal industry is suffering. The Chairman at the meeting was Dr. E. W. Smith; and there is a good deal to be said for his idea that benefit would attend the creation of an association to which all representatives of the Press could apply for dissection of information which came along—an association which would have facilities to approach any expert on particular matters and ask if what they intended to publish was true. The only thing to be said against this is that the Press works quickly, while, generally speaking, the expert loves to ponder; and by the time the expert has had his circular tour the subject under consideration may have lost any "news value." We think that the most direct and the most satisfactory method of preventing wild and misleading popular articles on technical problems being published in the Daily Press is for the Daily Press to employ on their staffs men who have been technically trained.

A good example of the type of argument employed in the popular papers is to be found in the articles written on low-temperature carbonization. Dr. C. H. Lander referred to this in the discussion at the Jubilee Meeting. "One often hears it argued," he said, "that if a particular process was applied at a particular pit, employment would be found there for another hundred miners. The trouble is, however, that certain people . . . would multiply this figure, and say that, if the process was applied to the 40 million tons of coal used annually in the domestic grates in this country, we should find work for 300,000 miners. I have seen this stated dozens of times, but it is entirely fallacious; the question of employing another thirty or forty miners in a particular pit is neither here nor there." Dr. Lander fails to see how low-temperature carbonization can make very much difference to the unemployment problem in the coal industry. Also, as oil is only a bye-product of the process, it cannot be obtained in anything like sufficient quantity to satisfy our needs. Dr. Lander put forward an exceedingly interesting argument on the assumption that a perfectly sound process could be found by which to treat all the 40 million tons of coal burned each year in the domestic grate. In a nutshell, it is this; From each ton of coal, 14 cwt. of coke would be produced. For every ton of coal formerly employed, the housewife would require 17 cwt. of coke. This would mean that 20/17ths of 40 million tons of coal would have to be treated. But gas would also be produced—and gas is

an extremely efficient fuel. Its use would probably not only wipe out the margin of extra coal mined, but swing the balance in the other direction. Thus the unemployment problem in the coal industry would not be solved by this means. We would pause for a moment, however, to emphasize the national advantages which would follow the burning of smokeless fuel in the domestic hearth.

Hydrogenation

THERE remain two other methods of producing petrol or a substitute from coal. One is by hydrogenation of either the coal itself or tar, and the other is the synthesis of alcohols from water gas. In regard to the former much new and valuable information was forthcoming at the Jubilee Meeting from Mr. K. Gordon (Synthetic Ammonia and Nitrates, Billingham-on-Tees). His Company have for many years dealt broadly with the problem of producing oil from coal. They have examined the prospects of low-temperature carbonization, of hydrogenation, and of water gas synthesis; and as a result they have arrived at the conclusion that hydrogenation of coal is the cheapest method. As the result of an economic survey, his Company have found that the price which could be paid for the tar would not be sufficient to make it economic to build low-temperature carbonization plants for industrial purposes, the solid fuel from which must be credited to the process at the same price as the raw coal. However, Mr. Gordon assured all working on low-temperature carbonization, and rightly developing the use of smokeless solid fuel for household purposes, that the tar could be made into petroi by hydrogenation, and a certain price could be given for it. And he expressed the definite opinion that at the present time, with a protective tax of 6d. per gallon on petrol, it would be a profitable proposition to produce petrol from coal by hydrogenation.

An installation on a " rational scale " is envisaged by Mr. L. H. Sensicle, who maintains that coal hydrogenation ought to be worked in conjunction with bye-product coking plants, the hydrogen being obtained from the surplus coke oven gas. The latter, he said, contains more than 50 p.ct. of hydrogen, which can be separated at a comparatively low cost by partial liquefaction methods; and he believes that, for coal hydrogenation, hydrogen could be obtained in this manner more cheaply than it can be made in existing plants. What Mr. Sensicle would like to see is a coke oven installation, centrally situated among a group of collieries, in which coke suitable for domestic work is made, the surplus hydrogen being applied to the liquefaction of a further quantity of coal, equal, perhaps, to twice the amount carbonized at the ovens.

In this brief review we have referred to only one or two views put forward in what cannot but be regarded generally as a dispassionate discussion of great value.

Landscape Lighting

IN September next part of the proceedings of the International Illumination Congress will be held in London, when visitors from many countries will be afforded the opportunity of viewing some remarkable spectacular lighting. The display to celebrate the Congress is being arranged by both the gas and the electricity interests, and it is to the application of gas to landscape illumination that we would call the attention of our readers. On later pages is a picture of St. James's Park as it was illuminated by gas on Tuesday evening of last week; the equipment employed for the purpose is also illustrated. The trial demonstration was witnessed by Their Majesties the King and Queen and by thousands of the public, who evinced great interest in the rehearsal and admiration of the results. The experiment was, indeed, highly successful, and promises brilliant results when the whole scheme is brought into operation in September.

At the time of the Congress members of the public, technical and non-technical, will have a visual demonstration that there is science behind gas lighting—that the Gas Industry is neither idle in research on illumination problems nor afraid to exhibit that gas is definitely a modern illuminant full of greater possibilities. The landscape lighting of St. James's Park, which can only be described as wonderful, is the outcome of research by the Gas Light and Coke Company and co-operation with the manufacturers of lighting equipment; and we have no doubt that other gas undertakings are making special efforts in their own areas to provide the International Congress with excellent examples of modern gas lighting, particularly as applied to street illumination.

In this connection we learn that it has been decided to increase the intensity of illumination of Whitehall for the Congress. As far as is known no main thoroughfare in England conforms to the B.E.S.A. Specification, Class A; and it is intended to raise the standard of the lighting in Whitehall to this class. The work is being carried out by the Gas Light and Coke Company with the co-operation of the manufacturers of the lamps and other equipment. The improved lighting will commence at King Charles Street and extend to Horseguards Avenue. This length of street will be lighted by 87 high-pressure lamps, which will be mounted on 29 columns, each column carrying three lamps. It is anticipated that the minimum illumination at the test points will be about 2½ foot candles. A special feature is that Class A illumination will be produced without the aid of any directional reflectors. We confidently anticipate that Whitehall in September will be one of the finest pieces of propaganda the Gas Industry could enjoy.

The Gas Grid Scheme

Now that the Bill of the Sheffield Gas Company to carry into effect the network scheme resulting from the recommendations of the Area Gas Supply Committee has passed both Houses of Parliament, the Company are in a position to take the citizens somewhat further into their confidence; and this has been done through a statement by the Chairman (Lieut.-Col. H. K. Stephenson, D.S.O.) which has been published in the local Press. The statement—a portion of which will be found on a later page of this issue of the " JOURNAL "—is an intriguing document, and the extract we give explains the Company's case in detail. With the full account of the proceedings in Committee which appeared in our pages last month it reveals the story of a scheme devised and prosecuted in the cause of cheap gas.

It will be recalled that the fight before the Committee of the House of Commons was a keen and protracted one, but that it ended in agreement between the parties. Prior to the proceedings, the South Yorkshire Gas Grid Company, Ltd. (comprising a majority of the coke oven owners in the district), withdrew their Bill—remaining as the organization through which the Sheffield Gas Company are to purchase the coke oven gas. There had, however, to be dealt with the opposition of certain gas undertakers; the Bill being, as Col. Stephenson says, " admittedly of a controversial nature." The petitioning undertakers included the Rotherham Corporation, with whose case the statement now published largely deals. Whether the arrangement made was as favourable to the Sheffield Company as the position they would have occupied after a fight to a finish, must remain undecided. It is, at any rate, the view of the Company, whose Chairman openly blames the Sheffield Chamber of Commerce for what has happened, that the position of his Company is not so favourable under a compromise as it would otherwise have been. According to his statement, " as it appeared useless to continue to spend money on the fight for cheap gas for Sheffield with the Chamber of Commerce supporting the claim of cheaper gas for Rotherham at the expense of Sheffield, the Company took the only course open to them, by making the best terms they could with the Rotherham Corporation and the other gas undertakings concerned." Extracts from the reply of the Chamber of Commerce to this statement give the facts of the case from their point of view, and their tribute to the Company's public spiritedness will be noted.

Rating of Public Utility Undertakings

At the recent convention of the Incorporated Municipal Electrical Association, Mr. Isaac Dixon, F.S.I., a well-known Liverpool Rating Surveyor, read a paper on "The Assessment of Electrical Undertakings in relation to Local Rating," in which he pointed out that "the gas and electrical industries work in a similar field. They each supply both light and power; they are each of the public utility type, and are each assessed for rating purposes on the same basis." He proceeded to outline the basis—"profit basis" or "revenue principle"—enunciated by the Courts as proper for the valuation of gas undertakings before the era of electricity; the rateable value being dependent on the accurate division of the profit between the hypothetical tenant and landlord. As to the accounts on which this estimate of rent is to be calculated, it was suggested that the valuer of a public utility undertaking should look to the future developments of the industry rather than merely follow the trading results which have obtained in the preceding period. While it is true that the Courts have held that anything which could reasonably be said to influence an incoming tenant in fixing the rent to be paid for occupation of the undertaking must be taken into consideration, it is also true that in the case of the Sheffield United Gas Company (1863) the estimation of rent was directed to be made on the basis of the last published accounts of the Company.

To illustrate his point, Mr. Dixon had prepared statistics to show the rapid increase in the capital expenditure of a number of large electric supply undertakings, and he pointed out that were a suggestion mooted in certain quarters—that the quinquennial re-valuation of public utilities should follow the practice enacted by the Railways (Valuation for Rating) Act, 1930, and be based on the accounts for the first five of the six accounting years immediately preceding the date on which the valuation list came into force—adopted, it would have the result, in these instances, of valuing the undertakings at some 30 p.ct. less than their present-day earning capacity. Until the Legislature otherwise decide, any departure from the established custom is to be deplored, if only that, unless universally adopted, it would tend to destroy the uniformity which it was the intention that the Rating and Valuation Act, 1925, should promote.

We would next consider the statement that the electricity industry is protected by legislation from unfair competition, and that in consequence it may be said that the remuneration attributed to tenant's capital in a rating valuation is excessive. This statement was vigorously opposed by the members of the I.M.E.A. who took part in the subsequent discussion, but the author of the paper maintained that, although electricity supply might not be monopolistic in a close sense, in practice it was very nearly so. What is claimed for the electricity supply industry in this connection may well be applied to the Gas Industry, and we cannot believe that the assumed monopolies possessed by these two large industries warrant the assumption that an allowance of 17½ p.ct. of the capital computed to be necessarily found by the hypothetical tenant is excessive, even in these days of low interest rates. It will be remembered that in the Bath Gas Company's Rating Appeal in 1929, while the rate was reduced to 15 p.ct., it was indicated that other factors were closely interwoven with this question, and that this could not be regarded as a binding precedent in subsequent cases.

In the course of Mr. Dixon's paper, reference was made to the unfair exclusion of public utility undertakings from the provisions of "de-rating" under the Rating and Valuation (Apportionment) Act, 1928. This matter has been referred to recently in the "Journal," and we are interested to note that our electrical friends are fully aware of the obvious injustice to two large public services; a great part of whose output is absorbed by industry in general.

Some further tables of comparative statistics were included in the paper, from which it appears that the local rates paid by the larger undertakings included in the previous table amounted to as much as 8·4 p.ct. of the gross receipts of the combined undertakings, and 17·7 p.ct. of the gross profit. In the opinion of the author, the most reasonable and suitable basis on which to compare the cost of rates is the relationship between the rates paid and gross profit, after making due allowance for working expenses, repairs, and renewals. From the data available in the 1930 edition of "Field's Analysis," which includes figures relating to 34 company and municipal gas undertakings in the British Isles, it would appear that the ratio of local rates to gross profit is not so burdensome to the gas undertakings as to the electric supply undertakings referred to by Mr. Dixon. This, however, must not be taken as meaning that the gas industry pays proportionately less in rates than its competitor. Such is not the case, and we are surprised to see that the Electrical Press have arrived at this conclusion. Indeed, Mr. Dixon expressed himself as being satisfied that the electricity supply industry is being treated quite as equitably as the Gas Industry.

PERSONAL

Mr. Ernest Edward Baker (76), of Weston-super-Mare, Deputy-Chairman of the Weston-super-Mare Gas Light Company, left £98,305 (net £73,641).

Mr. A. F. Ames, formerly Manager of the Oswaldtwistle Council's Gas Department, appointed to a similar position at Darwen, has been presented with a silver tea service by the employees and staff at Oswaldtwistle prior to his departure. He also received a burr walnut timepiece from the staff at Oswaldtwistle Town Hall. Mr. J. W. Booth made the presentation.

The tenure of the Gas Light and Coke Company's Gas Research Fellowship at the Imperial College of Science and Technology, South Kensington, by Mr. A. E. Haffner, B.Sc., A.R.C.S., has recently been extended for a second year from Oct. 1 next.

Mr. G. A. Mogford, one of the Cardiff Gas Light and Coke Company's Junior Assistants, has received an appointment with the Rio de Janeiro Light and Power Company, and is leaving for Brazil at the beginning of September. He served his articles under Mr. H. D. Madden, and this year was admitted as an Associate Member of the Institution of Gas Engineers, having passed the Institution's Higher Examination in Gas Engineering. An interesting feature about this appointment is that Mr. Mogford is the third Cardiff man to join the staff of the Rio de Janeiro Light and Power Company. Mr. C. H. Carder, the Chief Engineer, was at Cardiff for many years, and Mr. Leslie Jones, Assistant Distribution Engineer, also secured his present appointment from the Cardiff Company's staff.

OBITUARY

The death is announced of Mr. Harold Holcroft (79), of Tettenhall, Wolverhampton, Chairman and Director of the Bilston and the Willenhall Gas Companies.

Mr. H. J. Hearn, who had been a Director of the Shrewsbury Gas Light Company for 24 years, and Chairman for the past three years, died suddenly on Sunday last, July 26.

The death has taken place suddenly at Ballyshannon, Co. Donegal, of Mr. Wm. Miller, who left England several years ago to manage the gas-works in that town. He afterwards became proprietor. Some years ago when a private company installed an electric lighting plant in Ballyshannon he sold the gas plant to the Town Commissioners. Mr. Miller was a native of Blackburn.

Forthcoming Engagements.

Aug. 11.—Irish Association of Gas Managers.—Annual Meeting at the Guild Hall, Londonderry. President—Mr. G. Walmsley.

Sept. 10.—North British Association of Gas Managers.—Annual Meeting in Rothesay.

Sept. 16.—British Commercial Gas Association.—Meeting of General Committee at 28, Grosvenor Gardens, S.W. 1.

Sept. 17.—Society of British Gas Industries.—Council meeting in the afternoon.

Sept. 17.—Wales and Monmouthshire Association.—Meeting at Porthcawl.

CORRESPONDENCE

Water Heating Tariffs

SIR,—Your contributor "Engineer" in his article on Water Heating in the "JOURNAL" for July 8 makes out a very strong case for the all-in charge for small thermal storage heaters, and justifies it on a four-part tariff, with the proviso that the customer or service charge is already met by existing consumption, and the amount allowed for gas includes the cost into holder, *plus* manufacturing and distribution demands.

I agree in principle with the argument put forward, but as he has quoted estimated figures for Lytham St. Annes, I feel it would be better if actual ones were available, though the difference is only one of degree.

The National Gas Council Report on Gas Charges states "that the allocations given are not intended to be accepted as final," as they must necessarily be affected by local conditions and circumstances; and with the necessary adjustments Lytham St. Annes figures are as follows:

	£ s. d.	
Customer charge	2 3 8	per annum
Manufacturing demand . .	0 12 1	per 100 c.ft. per day
Distribution demand . . .	3 19 9	per 100 c.ft. per hour

Large capital expenditure accounts for the high customer charge, about 33⅓ p.ct. should be deducted to reduce it to a normal figure. The low distribution demand is due to a heavy cooking and fire load ranging up to 200,000 c.ft. per hour, the usual figure being 160,000 c.ft.

These figures applied to the thermal storage heater give:

	s. d.	
Manufacturing demand	13 3	per annum
Distribution demand	8 0	,,
Total	21 3	,,

which, deducted from the available balance of £2 7s., leaves a profit of £1 5s. 9d. in the case of the consumer who has already paid his full customer charge in his existing consumption, or is a contribution towards it if he has not.

I particularly pointed out that the system adopted is the heating unit connected up to the existing hot water cylinder, by which every advantage is taken of the coal-fired back boiler. This accounts for the low consumption of 40,000 c.ft. per annum, which is an actual average of several installations over 18 months.

The consumption of the few 20-gallon self-contained sets varies considerably from 50,000 to 65,000 c.ft., and we realize that at 4d. per day we stand to gain very little from these.

As stated, all private residences are connected to the mains, therefore water heating must be additional consumption, though it would naturally not be possible to restrict the special terms to consumers who pay the full customer charge in gas already purchased, yet we are assured of additional revenue from the consumer under the average.

The net cost of supplying and fixing the immersion heater, including lagging, is £7 10s., the figure of £8 12s. being the sale price, and is the same whatever size of domestic cylinder to which it is attached. In the case of large cylinders—say, 60 gallons—the consumer's requirements and desires are considered, and the heater is fixed in such a position in the cylinder that (say) 30 gallons of hot water content are provided, and the all-in charge rated accordingly—viz., 6d. per day.

No difficulty has arisen in meeting all normal domestic requirements.

An error has crept into "Engineer's" calculation for the equivalent price of gas of 40,000 c.ft. for £5 1s. 5d. It should be 2s. 6½d., *not* 3s. 4d. as stated. The rate of discount—*i.e.*, 32½ p.ct.—is, however, correct.

J. H. RANFT,
Engineer and Manager.

Lytham St. Annes Gas Department,
July 21, 1931.

THE NEWS OF THE WEEK

Membership of the Institution of Civil Engineers.—We have received from the Secretary of the Institution of Civil Engineers a list of members, with their addresses, corrected to July 1, 1931.

The Output of Gas from the works of the Compania de Gas de La Plata (Argentine) during the past year amounted to approximately 57,138,000 c.ft., as compared with 37,211,000 c.ft. in 1929—an advance of no less than 53·5 p.ct.

The Klonne Holder at Algiers.—In the "JOURNAL" last week we referred to the erection of a new gasholder at the works of Lebon & Cie. By an unfortunate oversight we gave the capacity of this holder as 17,650,000 c.ft., instead of the correct figure 1,765,000 c.ft.

The Directors of the Commercial Gas Company have declared a dividend on the ordinary stock for the half-year to June 30, 1931, at the rate of 6 p.ct. per annum (*less* income-tax), payable on Aug. 15. The dividend is at the same rate as that for the corresponding half-year of 1930.

Institution Research.—Mr. Thomas Hardie, M.Inst.C.E., M.Inst.Gas E., Chairman of the Joint Research Committee of the Institution of Gas Engineers and Leeds University, entertained members of the Committee and others at Luncheon at the Grosvenor Hotel, London, on Tuesday, July 21, after which an inspection was made of the tests being conducted by two of the Research Chemists of the Institution on the Carburetted Water Gas Plant at the Nine Elms Works of the Gas Light and Coke Company.

A New Vertical Retort Plant is to be installed at Stirling Gas-Works at a cost of £33,000. This was agreed to at a meeting of Stirling Gaslight Company on July 14. It is hoped that as a result of this improvement there will be an increase of £5000 in the annual revenue of the Company, and that eventually a reduction in the price of gas will be possible.

Price of Gas to be Reduced in Inverness.—At a meeting of the Water and Gas Committee of the Inverness Town Council on July 20 the Gas Manager recommended that an all-round reduction of 5d. per 1000 c.ft. be made as from May 15 last. Although the Gas Undertaking has to meet keen competition from electricity for lighting, it was reported that there was a steady increase in the demand for gas. The recommendation was adopted.

A Banquet will be held at the Dorchester Hotel, Park Lane, W. 1, on Wednesday, Sept. 2, 1931, at 7.30 p.m. for 7.45 p.m., in connection with the International Illumination Congress which is being held in this country for the first time since its inception in 1900, at which about 400 delegates from 15 foreign countries will be present. The price of the tickets is 2 guineas each, including wine, and application for these should be made to the Hon. Secretary of the Illuminating Engineering Society, Mr. J. S. Dow, 32, Victoria Street, S.W. 1, as soon as possible and preferably not later than July 24. Seats will be allocated in the order of application. It is intended to terminate the banquet at 10 p.m., and those desirous will be taken on a tour of inspection of the special floodlighting and street lighting features of London arranged for the Congress.

THE NEWS—*continued.*

The Midsomer Norton Gas & Coke Company are offering a " Newbridge " distance switch, to be fixed free, in connection with every purchase of a gas fire, cooker, or boiler during July, August, or September. The idea is proving very popular, and will help to increase both lighting and heating loads. In face of severe electrical competition, this Company have obtained the contract for street lighting for the next three years.

Self-Ignition Switches.

Mr. H. D. Robinson, Engineer and Manager to the Padiham Gas Department, writes to tell us that for the past four months he has had in use a " Newbridge " self-ignition switch.

The switch is fitted in Mr. Robinson's office, and comprises a 24 ft. run of cable controlling a Sugg five-light " Unique " pendant in the centre of the room. The cable is covered by Evered's metal sheathing, and the battery is fixed in the ceiling above the pendant, to make the whole job as inconspicuous as possible.

" During the whole of the period," states Mr. Robinson, " the switch has worked perfectly, both with and without globe and without either attention or renewal of the igniter or battery."

Freedom of Choice for L.C.C. Tenants.

In continuation of the report of the London County Council Housing Committee submitted on May 12, 1931, as to affording the Council's tenants freedom of choice in the use of gas and electricity, the Committee have decided to make no alteration in the arrangements for electricity and gas installations which have already been negotiated with the supply authorities. As regards all other future dwellings of the Council, it has been decided to invite the electricity supply authorities and the gas companies to state whether they will be prepared to lay the necessary mains and wire or carcase the dwellings for the purpose of giving the tenants the choice of a supply of electricity or gas, or both, without cost to the Council.

In connection with an undertaking by the Bermondsey Metropolitan Borough Council to wire for electric lighting the flats in Copperfield House, Dickens Estate, in which gas is also installed, the Committee have agreed to a condition that the tenants, after having chosen in the first place either gas or electricity for lighting, shall not be allowed to change the system without the consent of the Council.

As already stated in the " JOURNAL," the Committee have given permission for gas, in lieu of electric, cookers to be installed in the tenements at Whiston House, Shoreditch, at the request of the tenants, on condition that the Council is put to no expense in the matter.

Boston Company Report Successful Year.

A prosperous state of affairs was disclosed at the annual meeting of the Boston Gas Light and Coke Company.

Despite the past year of industrial depression, an increase of 6½ million c.ft., or 4·3 p.ct., in the gas sales during the year was recorded. It was also reported that since 1921 the sales of gas had increased from 108 million to 158 million c.ft.—an increase, over ten years, of 46·3 p.ct.

The net profit for the year amounts to £3404, and the Directors recommend the payment of the remainder of dividend at the usual rates—namely, 8½ p.ct. on the ordinary, and 7 p.ct. on the new ordinary shares.

Ald. Tom Kitwood, J.P., Chairman, presided at the meeting, and, in moving the adoption of the report, said that the use of gas for water heating showed satisfactory progress, and during the past year the Company had installed approximately 300 gas coppers, and other types of water heaters. The number of gas cookers on hire had been increased by 90 during the year.

An up-to-date tar treatment plant had recently been installed for the preparation of road tar, and they were hopeful, by cultivating a local market for this article, to increase the revenue from this bye-product. With regard to the works remodelling and reconstruction scheme, besides the work now proceeding in the erection of the new gasholder, the past year had seen the completion of the new tower scrubbers, new exhauster house and exhauster, new condenser, and the enlargement of most of the works' mains. This section of the plant had thereby increased in capacity by approximately 100 p.ct.

Carbonizing Tests at Birmingham.

Manufacture of Lignite Charcoal.

The Prime Minister of Greece (M. Venizelos) visited Birmingham on Monday week for the purpose of inspecting plant at the Nechells Gas-Works which, it is believed, will be of great assistance in enabling Greece to deal with the problem of the provision of fuel. Lignite, of which there are large quantities in Greece, has been successfully dealt with, and it is expected that similar plant made in Britain will in future be exported to Greece instead of that from Germany, which has hitherto been used. After the inspection of the plant M. Venizelos was entertained at luncheon by the Lord Mayor (Alderman W. W. Saunders).

Greece has no bituminous coal suitable for domestic or industrial use. There are, however, deposits of thousands of millions of tons of lignite. In Greece it is customary to cook over open braziers without chimneys or flues, and consequently it is essential that the domestic fuel should burn without smoke and not give off any unpleasant odours. The sole domestic fuel used to-day in Greece is wood charcoal. This is very expensive, and enormous forest areas are burnt annually to supply the country's needs. The alarming destruction of forests has led the Greek Government in recent years to give every encouragement to the production of lignite charcoal from the extensive lignite deposits.

Lignite is mined on a large scale in Germany, last year's production being over 140 million tons. It was natural, therefore, that Greece should turn for advice to Germany, where the lignite industry is so important and where a special Lignite Research Station has been in existence for many years. Nevertheless, endeavours to produce charcoal from Greek lignite by the simple application of the methods of charring lignite used in Germany proved unsuccessful, because Greek lignite is in many ways more like English coal than the German lignite—*i.e.*, it is mined in solid lumps, whereas the German lignite crumbles into powder when exposed to the air.

The Grecian Mining and Development Company, Ltd., the owners of the two largest lignite mines in Greece, has made a special study of this problem. Hitherto all the machinery purchased for the Greek lignite industry has come from Germany. Dr. C. H. Lander, of the British Fuel Research Board, who was approached for advice, suggested the application of the technique of high-temperature carbonization to the lignite problem.

By arrangements with the Gas Committee of the City of Birmingham, over 60 tons of Grecian lignite have been treated in the full-scale test works at the Nechells Gas-Works in Birmingham. The results obtained have far exceeded the expectations of the technicians in charge of the work. The lignite charcoal so produced, it is said, burns without smoke or smell. The gas produced is more than sufficient for the whole heating requirements of the process, and an appreciable quantity of tar oils is available for further treatment. The lignite charcoal produced has been submitted to a committee of Greek charcoal merchants, and it has met with their entire approval and passed all the tests of a first-class charcoal.

The Prime Minister was welcomed at Snow Hill Station by the Lord Mayor of Birmingham (Alderman W. W. Saunders), with whom were the Town Clerk (Mr. F. H. C. Wiltshire), Alderman J. H. Lloyd (Chairman of the Gas Committee), and Mr. A. W. Smith (General Manager and Secretary of the Department).

The Premier was accompanied by the Greek Minister in London and members of the staff of the Embassy, and several fuel technologists.

A thorough inspection was made of the high-temperature vertical carbonization plant at the Nechells Works, and the various processes were explained by Capt. Bennett. Those present included Sir Arthur Duckham, Dr. E. W. Smith, and the Managers of the Gas-Works of the Birmingham Undertaking.

At the Luncheon the toast of " The City of Birmingham " was proposed by Mons. D. Caclamanos (Envoy Extraordinary and Minister Plenipotentiary for Greece), who referred to the high place which Birmingham occupied in the industrial world, and to the great civic work done by Mr. Joseph Chamberlain.

In reply, the Lord Mayor said that they who were connected with the public life of Birmingham were glad that the Corporation Gas Department had been able to give some assistance in experimenting and demonstrating the application of British plants to solve the lignite fuel problem which he understood was of material importance to Greece.

The toast of " The Visitors " was submitted by Alderman J. H. Lloyd. It had been a great privilege, he said, to the Gas Department to provide facilities for testing out

the possibility of producing charcoal from Grecian lignite. It was a matter for satisfaction that the experiments indicated that successful results might be obtained by high-temperature carbonization with such plant as was installed at Nechells. "We are proud," the Alderman added, "that Birmingham does not take a parochial outlook in these matters." Birmingham had endeavoured to assist not only herself, but the whole of the Gas Industry and other industries in this and other countries by the research work which she had been able to undertake from time to time. Their hope was that their experiments would prove of use not only to the Greek Nation, with which Great Britain had always been on friendly terms, but to British manufacturers of plant.

The toast was replied to by Sir Arthur Duckham, K.C.B., G.B.E. They were proud, he said, of the municipal services of this country. Birmingham had given a lead to the world in municipal service. They were proud of the fact that the Gas Industry of Birmingham—a municipal Department—had showed such broadmindedness in carrying out the tests which they had witnessed. He personally owed much to the Birmingham Gas Department, which started him in early life by adopting one of his patents.

Sheffield Gas Company and the Grid Scheme.

Statement by the Chairman.

A few days ago the "Sheffield Daily Telegraph" published a communication from Lieut.-Col. H. K. Stephenson, D.S.O., Chairman of the Sheffield Gas Company, in which the writer remarked that, now that the Company's Coke Oven Gas Bill had been passed by both Houses of Parliament, the time had arrived when the veil might be lifted, and some of the difficulties, foreseen and unforeseen, which had menaced it might be exposed to public view. After giving a short history of the events which led up to the promotion of the Bill, the Chairman proceeded as follows:

The Bill was admittedly of a controversial nature, and petitions against it were lodged not only by the Coke Oven Owners' Company, but also by local authorities and gas undertakings, in the area affected by the proposed grid.

Under the auspices of the Board of Trade, terms were eventually arranged with the coke oven owners, who agreed to withdraw their Bill, and also with the various local authorities, other than those, including the Rotherham Corporation, which owned gas undertakings, and which, perhaps not unnaturally, did not desire to see the unlimited supply of coke oven gas, at present at their disposal, reduced by the operation of the grid.

In spite of the fact that the Sheffield Gas Company, in their Bill, placed no restriction on direct contracts between the coke oven owners and gas undertakings, and, in the event of failure to make such contracts, bound themselves to supply gas, if available, from the grid at a price to be agreed or settled by arbitration, practically all the gas undertakings affected, whether municipal or otherwise, demanded that their future potential requirements should be provided for by the reservation for them of specific quantities of gas at definite and highly preferential prices.

Questions of Price.

The Sheffield Gas Company felt unable to agree either to the quantities or the prices suggested, holding that reservation of gas for *possible* future requirements might interfere with their sale for *actual* needs in Sheffield, and that all gas, to whomsoever it might be sold, should be charged at a price which should include a fair contribution to interest and sinking fund on the capital of the grid.

It must have been obvious that the lower the price charged by the Sheffield Gas Company for gas from the grid sold in bulk to gas undertakings outside Sheffield the higher must be the price charged to Sheffield consumers whose battle the Company were fighting.

It must also have been clear that if gas undertakers outside Sheffield were able to buy gas from the grid at unduly low rates they would be able to retail it at lower prices than those at which it could be retailed in Sheffield—in other words, they would be able to supply their consumers at rates less than those at which it would be possible to supply consumers in Sheffield, with consequences prejudicial to our city and its industries.

Rotherham Petition.

Under these circumstances it gave the representatives of the Sheffield Gas Company a shock of painful surprise to learn during the presentation of their case that the Sheffield Chamber of Commerce had offered to provide witnesses in support of Rotherham's petition against the Bill.

Still more disconcerting was it to see representatives of the Chamber in close collaboration with Rotherham's advisers and the witnesses in question, sitting behind Rotherham's counsel, passing up slips of paper, and otherwise actively prompting them during the cross-examination of our witnesses.

As the ability of the Rotherham Corporation to put forward witnesses purporting to represent Sheffield industry under the ægis of the city's Chamber of Commerce might have had considerable weight with the Committee, and as it appeared useless to continue to spend money on the fight for cheap gas for Sheffield with the Chamber of Commerce supporting the claim of cheaper gas for Rotherham at the expense of Sheffield, the Company took the only course open to them by making the best terms they could with the Rotherham Corporation and the other gas undertakings concerned.

That these terms were probably more disadvantageous to Sheffield than those which could have been secured if the Chamber of Commerce had not intervened is a fairly obvious deduction.

The statement concluded with further references to the action of the Sheffield Chamber of Commerce in the matter.

Reply by the Chamber of Commerce.

Subsequently there was published a statement by Mr. A. J. C. Walters, the Secretary of the Sheffield Chamber of Commerce, which contained, *inter alia*, the following:

I am desired to indicate shortly the history of the matter so far as this Chamber is concerned. The Chamber was on May 6 requested by a prominent firm in the city to convene a meeting of the principal users of gas for industrial purposes. We at once realized the importance of the matter, and conferences were held, at which the matter was fully discussed. The points which seemed vital were:

1. The price at which the gas would be available for the industries.
2. To secure that the Sheffield consumers were not put at a disadvantage as against their competitors in the Rotherham district.

No spirit of hostility to the Gas Company was manifested at these conferences. On the contrary, it was recognized that the Company had served the city well in the past, and that in seeking to obtain an adequate supply of coke oven gas they were hoping to place themselves in a position still further to assist the industries of Sheffield, provided always that the terms and conditions were such as would make the use of the gas commercially possible.

The Secretary was instructed to invite a consultation with the Gas Company, but "was unable to get the desired appointment."

The Evidence.

In the course of the evidence given by the Gas Company during the proceedings in Committee, it became evident that the price which was being suggested on their behalf was the figure mentioned in the Area Gas Committee's report—viz., 10d. per 1000 c.ft., a price which the manufacturers were unanimous in believing could not attract the consumption of gas which the Company was aiming at—viz., 40 million c.ft. per day.

Under these circumstances, I was instructed to go to London with a representative of the consumers. It was thought important to let the Committee know that the price which had been suggested was one which could not be realized commercially, and I ascertained that this was the view of the witnesses to be called on behalf of the Rotherham Corporation. Having failed to establish satisfactory contact with the Company's representatives, my colleague and myself considered that the best course to take was to offer proof on behalf of the consumers as to the price which might reasonably be obtained. In no other sense was evidence to be tendered on behalf of the consumers, antagonistic to the Bill.

Gas-Heated Water Apparatus.

Lecture by Dr. A. Winter.

There was a large attendance of local plumbers at a lecture which was given last week at Showrooms of the Southport Gas Department in Eastbank Street. The lecture was delivered by Dr. A. Winter on the scientific construction of modern hot water apparatus.

In introducing the lecturer, Councillor Scott (Chairman of the Gas Committee) said he was pleased to welcome such a large and influential gathering of the Southport plumbing fraternity. There had always existed the most friendly feelings between the plumbers of the Borough and the Gas Estate, and it was the Committee's desire to maintain such feelings, and to foster the happy co-operation which was to their mutual advantage.

Mr. J. Bond (Engineer and Manager) in a few remarks preceding the lecture, gave a series of convincing figures dealing with the relative heating values of gas and other forms of fuel, and pointed out the economy effected by the use of gaseous fuel for all purposes in the home.

The lecture was illustrated by means of apparatus and a series of specially prepared lantern slides and dealt in full with the scientific construction of many forms of gas-heated apparatus for the provision of hot water for domestic purposes. The thermal storage of water was fully discussed, and results of actual tests showing the economy of the apparatus were submitted to the audience, and the

THE NEWS—continued.

methods of fitting the apparatus were thoroughly explained.

At the conclusion of the lecture, Mr. P. H. Christian (Outdoor Superintendent), in proposing a vote of thanks to Dr. Winter, said that the subject of water heating was one of never-failing interest and vital importance to the Department and consumers alike. Continual experiments were in progress in the Department, with the object of placing at the disposal of consumers the most up-to-date and efficient apparatus procurable. He appreciated the attendance that afternoon of such a large number of the local plumbers, showing indisputably their desire to co-operate with the Department in the commendable object of providing the gas consumer of the Borough with the most economical apparatus, coupled with the most expert fitting and installation.

Mr. Alfred Halsall seconded the vote of thanks, which was suitably responded to by Dr. Winter.

Renovation of Porthcawl Gas-Works.

No Exchequer Grant.

Mr. Evan Bowen presided over a meeting of the Porthcawl Council on July 19, when Mr. William Chorley, Deputy-Clerk, read a letter from the Unemployment Grants Committee in reply to the Council's application for a grant of £18,650 for the extension and renovation of the present gas-works. The Unemployment Grants Committee had reached the decision that they were unable to recommend a grant from the Exchequer.

Mr. Russell Mabley said that it was to be regretted that the Council could not get the grant applied for. He proposed that a Sub-Committee be formed to consider the question with a view to putting the matter on a proper footing with as little delay as possible. Mr. T. L. Richards seconded.

The Chairman, in supporting, said that he considered that they would be able to go forward without the assistance of the Unemployment Grants Committee.

The proposition was agreed to, Messrs. Evan Bowen (Chairman of the Gas Committee), Russell Mabley, J.P., (Chairman of the Council), Dan Davies, T. L. Richards, and E. J. Lewis being selected as the Sub-Committee.

Brighton and Worthing Company's Successful Co-Partnership Scheme.

At the tenth annual meeting of co-partners of the Brighton, Hove, and Worthing Gas Company, further indications of the growth and flourishing state of the co-partnership scheme were afforded by the report and accounts.

The Chairman, Mr. A. M. Paddon (who is Chairman of the Directors), said the continued and definite progress made during the ten years' existence was as satisfactory as it was important. Dealing with the report and statement of accounts, Mr. Paddon pointed out that the total income allotted to the co-partners (being an amount equal to 10 p.ct. of the dividends and interest paid by the Company in respect of the year ended Dec. 31, 1930) was £7894. A further sum of £4466 was received for dividends and interest, making a total credit to the co-partnership fund for the year of £12,361. During the year £1967 was paid out of the fund to certain co-partners (or their legal representatives) on termination of service with the Company, and £2789 was withdrawn in dividends and interest.

The balance of the fund at March 31 last was £71,544. £64,050 stock of the Company had been acquired at a cost of £61,485, and valued at £66,591. Cash held by the Company awaiting investment amounted to £9828. An original co-partner who had left his dividends and interest in the fund to accumulate received during the year a total credit of £17 12s. 4d. A co-partner who had not withdrawn his dividends and interest would now, on leaving the service of the Company, draw something like £150 in hard cash in addition to his pension. The total amount received by the co-partners during the 10 years of the existence of the scheme, added the Chairman, approximated £100,000.

The report was then adopted, and hearty thanks were accorded the Committee and officers for their excellent work, on the motion of the Chairman, seconded by Mr. Joseph Cash, M.Inst.C.E. (Director).

Mr. C. H. Rutter, Engineer and General Manager, replied on behalf of the Committee, of which he is Deputy Chairman, and Mr. E. P. Butcher, the Co-partnership Secretary, replied on b 'alf of the officers.

Proposing a vote of thanks to the Chairman, Mr. P. E. Browne, Distributing Engineer, mentioned that they had that day welcomed into the fold the Worthing Gas Company. He took the occasion to bid them welcome, and trusted the employees would i.. due course share the benefits of co-partnership.

Institution of Chemical Engineers.

Examination Questions for Associate-Membership.

We have received from Prof. J. W. Hinchley, the Hon. Secretary of the Institution of Chemical Engineers, a copy of the papers for the Associate-Membership examination of the Institution this year. As on previous occasions, the candidates were entertained at dinner at the Chemical Industry Club, after which the *viva voce* examination was held.

To give our readers some idea of the questions set in the written examinations, the following have been selected:

1. Discuss the physical principles governing the design and use of orifice instruments for the measurement of fluid flow, giving a critical discussion of the formulæ, which have been proposed for the conversion of readings into volume measurements.

Describe a few typical instruments with which you may be familiar.

2. Discuss general methods of temperature measurement in chemical engineering.

Describe the main features of the apparatus you would employ in the following particular cases, stating clearly any necessary precautions:

(*a*) Flue gas from a steam boiler ranging from 300° to 600° Fahr.

(*b*) A hardening and annealing furnace in which steel dies are treated to a bright-red heat and where the temperature must be determined very closely.

(*c*) A less accurate method suitable for use in a furnace working at temperatures between 1500° and 3000° Fahr.

3. Write a short essay on the "Selection and Scientific Application of Heat Insulating Materials."

Calculate *approximately* the heating surface necessary for a steam heating coil for *maintaining* a closed hot water storage tank 2 m. diam. by 2 m. deep at 80° C.

(*a*) Without lagging.

(*b*) With lagging (details of which should be stated).

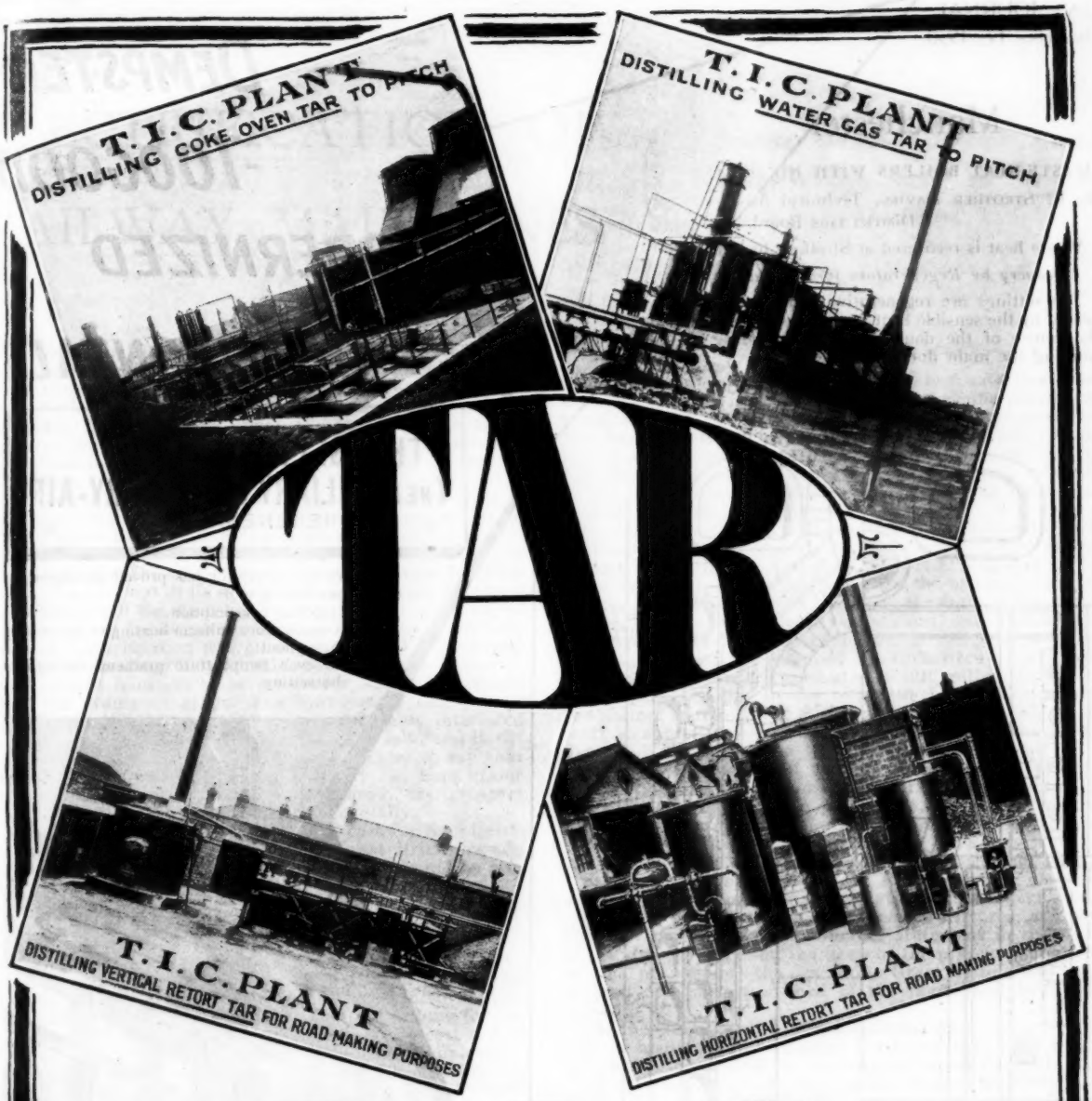
Gas Chambers and Coke Ovens, Ltd.

The Annual General Meeting of this Company was held on July 17, when the Chairman, Major B. J. M. Bebb, in the course of his remarks to the shareholders, after referring to the strong financial position disclosed by the balance-sheet and the satisfactory progress of the Company, mentioned some of the contracts completed or under execution, and particularly the 1300 tons per day coke oven and bye-product plant carried out for the Imperial Continental Gas Association, of London, during the past year.

He also referred to the successful operation of the "C.O.L." intermittent vertical chamber plant recently started at the Flathouse Works of the Portsmouth Gas Company, and remarked further that the Company had on hand large contracts for the Gas Light and Coke Company and the Wandsworth and District Gas Company, while they had just recently been successful in obtaining two important contracts in the British Colonies.

The Directors' report showed that the profit for the year, after providing for Directors' fees and depreciation, and after charging expenditure carried forward last year was £6450 19s. 8d., and the Directors recommended that this sum be appropriated as follows: In writing off preliminary expenses £1000; in reserving for income-tax £500; and in paying a dividend in respect of the year ended March 31 last at the rate of 8 p.ct. per annum, less income-tax, on the amount paid up on the preferred ordinary shares; leaving a credit balance to carry forward of £290 6s. 3d.

The Company has now been in existence a little over two years, continued the report, and the results have not only been sufficient to cover the heavy initial expense involved in developing a technical and commercial organization, and creating a wide connection in the gas and coke oven industries, but have, in addition, shown a modest profit. The contracting situation during the past year, having regard to the general industrial depression, was, on the whole, satisfactory, and again demonstrated the value of the firm's licences and patents.


T.I.C. PLANT
DISTILLING COKE OVEN TAR TO PITCH
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GAS JOURNAL
December 17, 1930

Manchester

WASTE-HEAT BOILERS WITH HO

By E. STROTHER DAVIES, Technical A
District Gas Board.

Waste heat is recovered at Stretford by two

1 *Recovery by Regenerators for Preheating S*

The settings are regenerative and the secondar
heated by the sensible heat in the waste gases which
the centre of the double row of secondary air tub
entering the main flue

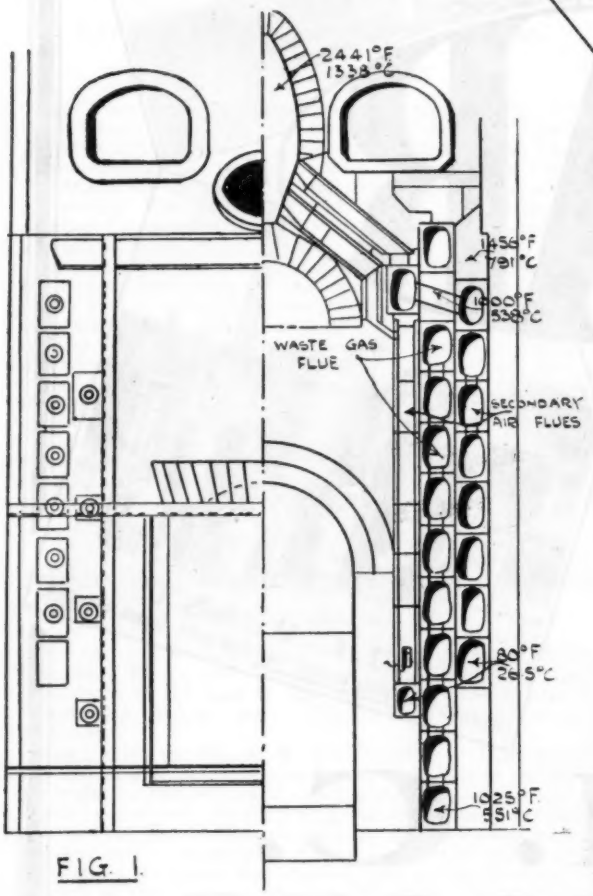

FIG. 1.

It must be realized that the amount of heat recovered by re-
generative settings is based on the area of the regenerator flues
in relation to the volume of secondary air and waste gas
that at Stretford waste heat is recovered for steam
after the maximum efficiency has been ob
and efficient regenerators. Fig. 1 sh
the regenerator and setting wi
points.

With regene
shown

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MODERNIZED
HORIZONTALS

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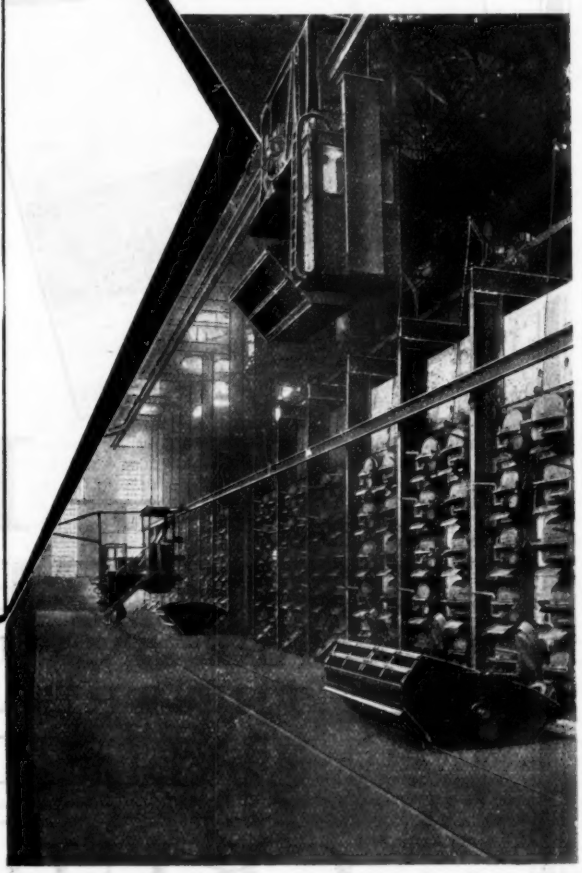
(1) Low fuel consumption.
(2) A much more uniform heating of the setting throughout.
(3) An even temperature gradient throughout the setting.



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ELECTRIFICATION OF RAILWAY MAIN LINES

Scheme discussed by Sir David Milne-Watson and Sir Arthur Duckham

At the annual luncheon of the Central Executive Board of the National Gas Council, at the Savoy Hotel, on Monday, there were important addresses by the Chairman (Sir David Milne-Watson, D.L., LL.D.) and Sir Arthur Duckham, K.C.B., G.B.E., upon the proposed scheme for the electrification of the main line railways of the country as outlined in the Report of the Committee presided over by Lord Weir.

Sir DAVID MILNE-WATSON said: On this, the occasion of our annual luncheon, and at a time when so much attention is being given to the country's economic and industrial difficulties, I would like to take the opportunity of saying a few words to you on the subject of the latest suggestion for helping the country out of its difficulties—namely, the proposed electrification of the main line railways.

Immediately the Report of the Committee on Main Line Railway Electrification was published, we had it examined in order to ascertain its probable effect upon our Industry. The foremost question to be considered was how it would affect the transport of our raw materials. Carbonizing annually 18 million tons of coal, we are deeply interested in the cheap transport of both coal and the solid and liquid products which we derive therefrom. I regret to say that we found nothing in this Report to justify any hope of our transport costs being reduced—nor, indeed, any prospect of any reduction in transport charges generally.

It is estimated that the total capital cost for the electrification of the main line railways in Great Britain would amount to £340,000,000, of which £80,000,000 would be provided by the Central Electricity Board, leaving £260,000,000 to be found by the railway companies. The annual savings from this electrification are estimated at £17,500,000, which would give a return of 6·7 p.ct. to the railways upon the said sum of £260,000,000.

It is evident, therefore, that there is little margin for effecting any reduction in transport costs. Moreover, this huge sum of £340,000,000 does not provide anything for the electrification of the sidings, which would itself cost a vast sum and without which the scheme would be incomplete.

Everyone is more or less agreed on the advisability of the electrification of the suburban lines, but the question before the country is not one of suburban traffic only, but of main line haulage. Already the speed of our steam-driven trains compares most favourably with that of the trains in continental countries, and therefore it is difficult to see in that direction wherein lies the advantage of electrification. It must be admitted that the possible saving is extremely shadowy, and a very small error would turn this problematical saving into a definite loss. In commenting on the estimated saving, the Report itself says:

> *P.* 21, *Section* 45.—Such a return taken by itself would not appear from a business point of view to warrant the adoption of a scheme of such exceptional magnitude. The margin would in our view be too narrow for the risks and contingencies involved.

Those are very weighty words. In view of this expression of opinion by the Committee, it is important to consider the estimates contained in the Report which recommended the establishment of the National Electricity Grid. You will recollect that the Chairman of both Committees was the same, and the Technical Advisers largely the same.

Let us examine this Railway Electrification Report in the light of the earlier Grid Report. It was estimated that a sum of £25,000,000 would be sufficient to cover the cost of construction of the grid, the necessary working capital, a sufficient reserve to cover the initial expenses and management, and interest capitalized for a period of (say) five years, at which date the net earnings from the grid should be sufficient for all purposes. The Grid Scheme also contemplated a standardization of frequency, the estimated cost of which was £8,000,000. This aggregate amount of £33,000,000 was to be expended during the first five years, and was apparently deemed sufficient to establish the National Electricity Grid throughout the country.

GRID ESTIMATES OF COST EXCEEDED.

In the Report issued by the Central Electricity Board for the year 1930, it is made quite clear that the actual expenditure will be considerably in excess of this estimate. The Report states that the Board are faced with an expenditure of approximately £50,000,000, as against an estimate of £33,500,000, of which £16,300,000 is the present estimate of the cost of standardization of frequency, as against an original estimate of £8,000,000.

In this connection, it is interesting to note that the present estimate for carrying out the standardization of frequency in one district alone—namely, N.E. England—is no less a sum than £9,000,000, although the original estimate for the standardization of frequency throughout the whole country was, as I have already mentioned, only £8,000,0000.

It was stated in the Report that in the year 1923 the amount of electricity supplied by authorized undertakers throughout the country amounted to 4016 million units, and it was estimated that by the year 1940 that figure would in the normal course rise to 21,385 million units, which represents an annual average increase of 25 p.ct. upon the datum figure.

The Report also stated that in the year 1923 the electricity supplied by authorized undertakers amounted to 110 units per head of the population, and that this *per capita* consumption would by about the year 1940 increase to 500 units per head of the population. This represents an average annual increase on the *per capita* basis of 21 p.ct.

Seeing that it is clear from the Report that no material addition to the population was anticipated between these years, it is difficult to reconcile these two figures, and this difficulty is increased by a further statement in the body of the Report that " on the basis of the present increase—19 p.ct. per annum—the demand in Great Britain will have reached 500 units per head of the population by about 1940."

The increases which I have mentioned were deemed to be normal increases, and it was anticipated that they would be rapidly accelerated by the introduction of the grid.

In a Memorandum attached to the Report, the Chairman of the Electricity Commission definitely stated that " with the adoption of a comprehensive economic scheme, it is probable that this average consumption (viz., 500 units per head of the population) will be reached long before 1940."

THE POSITION AS IT IS TO-DAY.

Let us now consider the actual position: If we take the year 1928, the total number of units sold according to the Report of the Electricity Commissioners was 7603 million units, as compared with an estimate of 9124 million units. In 1929, the total number of units sold was 8597 million units as compared with an estimate of 10,146 million units. If we convert these figures to a *per capita* consumption, we find that the actual consumption in 1928 was 171 units, and in 1929, 193 units per head of the population as compared with the estimate of 225 and 248 units respectively if based on one of the estimates contained in the Report, or compared with 247 and 275 units if based on the other estimate. The object of all this is to show that if these estimates are so excessive, what is to become of the estimates with regard to main line railway electrification. This vast figure of £340,000,000 is so big that I do not suppose anyone can realize what such a figure means.

It is evident, therefore, that not only has expenditure had to be incurred greatly in excess of the estimate, but that whichever basis is adopted for purposes of calculation, the consumption of electricity falls considerably short of the original estimate.

Having regard to the disparity between the estimated and actual expenditure on the one hand and the estimated and actual demand for electricity on the other hand, can we place any more confidence in the estimates contained in the new Railway Electrification Report? In this connection one cannot overlook the fact that in the future the

Central Electricity Board will not be able to continue to pay interest out of capital, but will be under the further obligation of redeeming all money borrowed for purposes other than standardization of frequency. Up to the end of the year 1930 no less a sum than £11,181,600 had been so borrowed.

Assuming, however, that the estimated expenditure will not be exceeded, and assuming that after twenty years electricity can be supplied at 0·475d. per unit, what advantage will accrue to the nation? Admittedly, a great portion of the estimated saving can only be achieved at the expense of labour, by dispensing with the services of locomotive drivers and guards. The estimated saving under this head accounts for nearly 50 p.ct. of the total savings.

Reduction in Coal Consumption.

Perhaps even more serious is the estimated reduction in the consumption of coal—namely, 9,750,000 tons—a saving which can only be justified if it is accompanied by corresponding advantages to the mining industry and industry generally.

It is understood that a reduction in the consumption of 9,750,000 tons of coal by the railways would necessitate the permanent unemployment of 45,000 miners. Is it possible to justify this addition to the ranks of the unemployed in the mining industry without offering any compensating advantage?

The country's greatest need at the present time is the recovery of its export markets, and to achieve that end it is essential that the cost of production should be brought down. Everything that tends to reduce the cost of production and increase the export of manufactured goods should be encouraged. Judged from that standpoint, the proposal for the electrification of main line railways fails.

The expenditure of £340,000,000 can only be justified if it is going to result in the improvement of our industrial position. Think what the expenditure of this vast sum would do for our heavy industries, which are really depressed at the present time.

It is anticipated that the electrification of railways would assist industry in general by enabling electric power to be supplied at lower rates. Can this contention be justified? Electricity is to-day being supplied in this country at lower rates than in many foreign countries. Industry can obtain electricity to-day in most cases at prices as low as those promised in the Grid Report, and in many cases can make it themselves even cheaper.

Even if it were found possible, as a result of this vast expenditure upon the electrification of the railways, to reduce the present cost of power to industry, it must be remembered that the power costs in industry to-day in the great majority of cases form only a negligible proportion of the cost of the manufactured article, whether it be a ship or a sewing-machine.

I feel, therefore, that before any definite steps are taken to give effect to the findings of the Committee on Main Line Railway Electrification, the whole subject requires much further thought; and I was very glad to read that the Minister of Transport, in speaking on this question in the House of Commons last Wednesday, said that the Government will consider the Report with every sense of responsibility.

All we desire as industrialists, deeply interested in the financial commitments of the country, and as large users of railway transport, is that no definite steps should be taken to spend this vast sum of money, unless it can be proved up to the hilt that it is going to improve and cheapen railway transport.

The Purpose of the Scheme.

Sir Arthur Duckham: I have been asked by Sir David Milne-Watson to express my personal opinion on the Report of the Weir Committee on Main Line Railway Electrification.

I have read the Report, and naturally appreciate the splendid services rendered by the members of the Committee and the witnesses who prepared and gave evidence. I am closely interested in railway working; from the national point of view, from the fact that I travel approximately 1000 miles a week on railways, and as Chairman of the Mineral Transport Committee, in which position over the last five years I have been endeavouring to discover and recommend means of increasing the efficiency and lowering the cost of mineral transport.

I have always wondered why suburban traffic was not electrified more fully. I know through my position as Chairman of the Public Utilities (Loans and Grants) Committee that most of the railways have schemes for the electrification of their suburban lines, but these schemes have not gone forward owing to the high cost of electrification itself, and of altering termini such as Liverpool Street, Fenchurch Street, King's Cross, St. Pancras, and Euston.

I have never felt as a main line railway passenger, or as one interested in the efficiency and low cost of mineral transport, that electrification would bring any benefit. Speeds cannot safely be increased on main line through traffic—further, the electric locomotive has no advantage over the steam locomotive in the matter of speed except on gradients, and it is not the running speed of the goods train which causes the delay in mineral transport.

It is not apparent that the reason for the investigation and Report is to provide better, cheaper long distance passenger service or better goods service on the railways, and I can only arrive at the conclusion that the reason for the Report is to obtain a better load factor for the National Electricity Scheme and central station electric generation.

I agree that it is for the benefit of the country that as good a load factor as possible should be obtained for all power stations, provided that the cost of electricity is reduced thereby and the service rendered more reliable, and no undue capital expenditure is embarked on.

I feel that the Central Electricity Board could have done much more than they have done with those great users of power throughout the country—the collieries. In that I have endeavoured to do something during the past few years—without success. I believe on the one hand certain of the collieries could have put electricity into the grid at very low prices, lower than the average prices obtainable at the central stations, and on the other hand, by close co-operation with the Electricity Authority, they could have helped to balance the load factor at the central stations.

We must realize that to-day something else than cheap power is required to bring our industries back to prosperity. Even if all factories could buy their electricity at ½d. a unit, this would of itself make no appreciable change in the present situation; nor would gas at half the price it is to-day; nor would electricity at ½d. per unit.

As an ordinary man I was amazed by the immensity of the figures discussed in the report. An expenditure of over three hundred million pounds is talked of. Very few of us have any realization of such an immense figure. During the war money was of little importance, and hundreds, and even thousands, of millions of pounds were spent in our dire necessity. This looseness of financial thought has stayed with us after the war, and has been the chief cause of national extravagance. Lord Weir and men of the standing of his colleagues, the leaders of finance and industry, have warned us against any expenditure of public money that is not absolutely and immediately essential.

Seven Prime Ministers have been sitting in London for three or four days last week to settle whether a continuing credit of twenty million pounds should be given to Germany, in order to prevent an impending financial international catastrophe which might well create a situation comparable in its reactions to the world war—one-fifteenth of the sum which is estimated as necessary for railway main line electrification.

One-tenth of the sum mentioned in the Weir Report would put the iron and steel industry on a sound basis, with the resultant great increase of employment in all trades, including the electrical trades, during the re-organization of the works and the consequent and permanent increase of employment in the manufacture of national primary commodities—commodities which we can make at a price comparable with world prices and under conditions of as great, if not greater, efficiency than exists even in other countries.

A return of prosperity to the iron and steel industry would revive the coal industry, increase the receipts of the railways from heavy transport, require a greater output of electricity, and so give a better load factor, and, in fact, would have a far greater effect on unemployment than any other national move.

By the use of a small portion of this sum the mineral royalties of this country could be acquired for the State. This, as has been agreed by every Commission of the Coal Industry, is the first and absolutely necessary step for the true and proper re-organization of the coal industry.

But instead of these things, it is suggested that this country should make itself responsible for the expenditure of nearly three hundred and fifty million pounds, with the result that—if all the surmises of the Committee are realized (and I know no Committee's Report in which even the majority of its surmises have been realized)—there might be a sum available equal to a 2 p.ct. return on the new capital, or about ½ p.ct. return on the existing capital, or possibly this return would be available to reduce transport charges. There would be increased unemployment, and the question as to whether the handling of mineral and goods transport would be as efficient or as cheap is left in the air.

I fully realize that the expenditure of three hundred and fifty million pounds would mean a large amount of

employment for a period, but so would these other reforms mean employment, not only for a period, but permanently.

I realize that if all surmises become facts, the price of electricity at the central generating station might be reduced by a maximum of ⅛th of a penny per unit.

My friends in the electrical manufacturing industry tell me that if the electrification of railways is taken up as a national programme, they would be busy for twenty years. I would rather see our other great industries—coal, iron, steel—permanently busy as well. The electrical industry has already received a great boost from Government money in the grid scheme, erection of super-power stations, and the conversion of electrical apparatus to standard frequency. This work I believe will eventually be for the benefit of the country, but the expectations that were held out and the assertions of the experts when the scheme was approved have only partially become facts, and the expected savings had not been realized.

A Time for Economy.

To-day is the time for economy, and no national money should be expended unless we can surely see the utmost and the quickest return. Not even the strongest adherent of railway electrification can promise us any true benefit from electrification until after twenty years, and during that period we should have to put up with disorganization of our railway system.

My close association with mineral transport makes me stress the goods traffic side. The electrification of railways would certainly not improve mineral transport. The work of shunting and terminals would be more difficult with electrical equipment. One cannot envisage steam or petrol-electric locos. being held available at sidings.

We have been endeavouring for a number of years to obtain larger wagons for mineral transport. The factor that prevents these larger wagons being put into general practice, and which prevents the Government from issuing instructions that no smaller wagons are to be built, is that the majority of terminals are not suited for the larger wagons, and that it is doubtful as to whether the cost of changing the terminals is warranted by the benefits that would accrue from the use of 20-ton wagons.

Under this railway electrification scheme how much greater alterations and changes will have to be made at the terminals and sidings, both public and private? How could this greater expenditure be justified—would the cost of mineral transport be reduced? Would the facilities for handling mineral transport be increased? I say emphatically, No.

I never travel a long journey in a motor-car if I can help it. It is too tiring and it takes too long. The railway companies will not attract further long-distance passenger traffic by putting an electric locomotive on the train instead of a steam locomotive. They will only attract this traffic by giving improved accommodation on the trains to compare with the comfortable and individual seats on the motor 'buses, by giving other service during transit, and by so doing making travelling more interesting, easier, and more pleasant.

I would conclude on the main point of my arguments—that I can see no national benefit arising from the proposed expenditure on main line railway electrification. I can see the risk of heavy national loss. I am certain that by an expenditure comparably insignificant, our great staple industries—textile, coal, iron and steel—can be re-organized with an immediate and lasting benefit to the country; and I do strongly hold that any expenditure of public money or the guaranteeing of capital by the State should be taboo at this time of financial depression unless such expenditure ensures immediate and lasting benefits.

Siding and Terminal Accommodation.

Mr. William Cash: I should like to express the thanks of all present to Sir David Milne-Watson and Sir Arthur Duckham, and at the same time to say one or two words in regard to what has taken place and on the addresses we have just listened to. Personally, I am extremely glad that our Chairman and Sir Arthur Duckham have thought fit to call attention to this suggestion made by a Government Committee, at this time, of all times, that our national railways should spend the sum of £340,000,000 in order to obtain at some distant date, possibly twenty years hence, some small advantage to railway stockholders. Sir David has made it clear that we as an Industry are interested in this matter, apart from the point of view of taxpayers, as individuals who are largely dependent on the railways for our transport; and I think it is very fitting that we should have had uttered this word of warning at the present time. This scheme seems to be put forward with a certain amount of authority, but without very much criticism on the part of those who will be asked to bear any burden which may arise if it is not the success it was hoped to be. Sir Arthur Duckham has drawn attention to a matter—viz., the question of siding and terminal accommodation—which must be of the very greatest importance if railway electrification is ever carried out. I have been told that there will be very real risk to the actual employees in working sidings electrically as compared with steam working, apart from the difficulty in handling traffic. Another matter which seems to me of national importance is the fact that the power of such railways would be centred in a few places, and in the hands of comparatively small staffs, in the event of any difficulty arising in giving the current required by the railways to carry on their work.

Where is the Additional Traffic to Come From?

However, the question which matters most of all is that at this time, when we find the State and the country generally labouring under economic difficulties such as we have to-day, we should be asked to embark on this tremendous expenditure. Looking at it from a somewhat simple aspect, and taking round figures, if we spend £300,000,000 and have to pay 5 p.ct. on that, the sum of £15,000,000 per annum will be required as interest on that capital expenditure. If we take the working expenses at 75 p.ct. of the gross receipts, you will want an additional traffic of £60,000,000 per annum to pay that 5 p.ct. on the capital expenditure. Where that additional traffic is to come from, I fail to see. Fortunately there are other bodies also watching this question of our present financial position, and I really do hope that some of these people will point out to the Government the seriousness of the nation's present financial position and the inopportuneness of a scheme of this magnitude and its risk, because there must be a risk in an expenditure of this magnitude at the present juncture. The mere fact that such a colossal expenditure is suggested seems to be a finger-post pointing out a lack of appreciation of the country's financial position to-day. When we read what the Chancellor of the Exchequer has said as to the Budgetary position of this country in the coming year, and we read in the papers every day of the financial results, of the dividends declared—or, rather, not declared—by some of our important industries, what are going to be the receipts to the national Exchequer from income-tax in the year 1931-32, and how is the Budget going to be balanced?

In addition, we have other demands, national and international; and taking the whole position into consideration this scheme requires far more inquiry, far more care, and far more germination than it has yet had before this country is asked to embark upon such an expenditure. Electrification of the main lines is a very different matter from the electrification of the suburban lines. As Sir Arthur Duckham has said, on long distance travelling you will not get there any quicker with an electric locomotive than with a steam locomotive. With regard to mineral and heavy goods traffic, the advantages cannot be very great. You have probably noticed that during the past few weeks the question of the London Passenger Traffic Board has been discussed at great length. That Board is to take over the London passenger traffic and deal with it, and find additional money for extending the facilities for traffic in London, and for many other things.

That envisages of itself a very large capital expenditure which apparently those who have hitherto been responsible for London traffic have not thought it worth while to embark upon, because of the financial risks and difficulties that arise. Whether that is a step towards nationalization, we do not want to discuss here to-day. Perhaps I have spoken too long, but I do want, before we separate, to express our thanks to Sir David Milne-Watson and Sir Arthur Duckham for what they have said to-day. Sir Arthur speaks with great experience of industrial inquiries, and it is very helpful for us to hear his views and also those of Sir David; and I am sure you will wish to express your thanks to them.

The vote of thanks was cordially given, and Sir David Milne-Watson briefly expressed his thanks and his pleasure that so many had been able to accept the invitation to be present at the luncheon.

REVIEWS

SAMPLING AND ANALYSIS OF COAL.*

The work of the preparation of British Standard Specifications for the Sampling and Analysis of Coal and Coke, which was begun in 1927 at the instance of the Department of Scientific and Industrial Research, has been brought a stage nearer completion by the recent issue of the British Standard Specification for the Sampling and Analysis of Coal for Inland Purposes (B.S.S. No. 420—1931).

This specification should be read in conjunction with the Report by Dr. E. S. Grumell and Dr. A. C. Dunningham on the Sampling of Small Fuel up to 3 in.—(B.S.S. No. 403), issued in December of last year—as the Report embodies some general principles of sampling, the explanation in regard to which is important as supplying justification for the comparatively speaking small samples specified in the specification.

The Sampling Section of the Specification is at present confined to coal passing through a 3 in. diameter perforated plate screen. The sizes of gross sample required are graded in accordance with the average ash percentage and the size of the fuel, and figures have been specified such that a gross sample taken in accordance with the specification should contain an ash percentage within ± one unit of the average ash content of the consignment. Full particulars are given of the method of collection of the gross sample from chutes, conveyors, and wagons, and the method of reduction is closely specified.

As in the case of the Export Specification, the methods of analysis are the simple, practical ones used in sound, commercial practice at the present time. Methods are included dealing with the determination of moisture, volatile matter, ash, calorific value, sulphur, and arsenic; and in most cases alternative methods have been put forward.

The question of the sampling of large screened coal and run-of-mine coal is still under consideration, and a comprehensive series of tests has been carried out by the collieries, power stations, gas companies, railways, and others throughout the country, which has already gone a long way towards ensuring a satisfactory solution to this very difficult problem. At the present time a tentative specification has been prepared, and it is proposed to carry out a further series of tests in order to confirm the proposed weights of gross sample.

A method has also been prepared for the determination of the fusion temperature of coal ash, and it is hoped to issue this early in the autumn.

Committees are still at work dealing with the question of the preparation of a British standard method for the determination of the agglutinating value of coal; while methods are in the course of preparation for the sampling and analysis of coke.

With reference to the specification for the Sampling and Analysis of Coal for Export Purposes, which was issued in December of last year, it is of interest to note that German and French translations of the specifications are now available, and that these are finding a ready sale in the countries to which British coal is exported.

* British Standard Specification for the Sampling and Analysis of Coal for Inland Purposes (B.S.S. No. 420—1931). British Engineering Standards Association, Publications Department, 28, Victoria Street, S.W. 1: price 2s. 2d. post free.

THE NEW BUSSEY RETORT.*

A few weeks ago ("JOURNAL" for July 1) we published an article by Mr. Howard T. Wright describing recent improvements in the design of plant employed by the Bussey Coal Distillation Company, Ltd., at Glenboig. There has now been issued by the Department of Scientific Research a report by the Director of Fuel Research, Dr. C. H. Lander, on a test on this improved plant, which was carried out in November, 1930.

The plant at Glenboig, as described in the "JOURNAL" at the time, was erected in 1929, and consisted of fourteen retorts of the type which are internally heated by the combustion of a portion of the charge in the retorts, a mixture of air and steam being introduced near the base. The test was carried out on one retort of the installation which had been modified by Mr. Wright in the light of experience gained.

The test lasted 124 hours, and 89·14 tons of a weakly caking coal, sold as "Bothwell washed trebles," was carbonized at an average throughput of 17·24 tons per day.

The operation of the retort, states the report, was uniformly satisfactory. No difficulty was experienced in charging or discharging, or in controlling the temperatures and other conditions. The yield of products per ton of coal, containing 11·1 p.ct. of moisture as charged, was as follows:

Coke, cwt.		10·20
Tar, galls.		17·61
Liquor, galls.		49·4
Gas	c.ft.	40,270
	therms	76·0
Gas spirit, galls.		3·24

The tar is a normal low-temperature product. Of the coke made, 17 p.ct. was breeze passing through a ½-in. screen. The temperature inside the charge must have been higher than 600° C. The volatile content of the coke, and of the breeze particularly, is rather higher than is usually obtained at this temperature, due apparently to the presence of a little incompletely carbonized material in the small sizes. Combustibility tests show that the lump coke forms a satisfactory fuel for domestic grates of the vertical bar type. The coke is hard, and can be handled without suffering much breakage.

The volume of gas made was high, but its calorific value—189 B.Th.U. per c.ft.—was low, due in part to leakage of about 10 p.ct. of air into the system. The amount of light spirit present in the gas is high, and the total yield of tar and gas spirit is satisfactory. The ammoniacal liquor made is high in volume, but, in common with other low-temperature liquors, of little or no commercial value.

* Department of Scientific and Industrial Research. Report of a test by the Director of Fuel Research on a retort of the Bussey Coal Distillation Company, Ltd., at Glenboig. Published by H.M. Stationery Office, Adastral House, Kingsway, W.C. 2; price 9d. net.

COKE RESEARCH IN 1930.*

The Northern Coke Research Committee have published a summary of the work carried out during 1930 in the Northern Coke Research Laboratory. During the past year, the work of the Committee has continued to expand and progress.

An apparatus has been devised in which the change in volatile matter content of a coal, when heated at definite rates, comparable with those obtained under full-scale carbonizing conditions, can be measured continuously. Preliminary experiments have shown that the rate of liberation of volatile matter is (*a*) dependent on the original volatile matter content of the coal and (*b*) is greatest for all the coals so far examined between temperatures of 400° and 500° C.

The coke yield obtained in this apparatus exceeds by about 5 p.ct. the coke yield indicated by the standard method for the determination of volatile matter, and it is suggested that the new apparatus gives coke yields more directly comparable with those obtained in practice.

Another apparatus has been constructed, in which it is possible to measure the degree of swelling, the temperatures of softening and of initial contraction, of pronounced thermal decomposition, and of solidification, the magnitude of the plastic range, and the final change in length of the carbonized charge. Preliminary experiments have been carried out to determine the relationship of these properties to (*a*) the type of coal and (*b*) the rate of heating.

While data from these two independent tests have much intrinsic interest, they assume their greatest importance when correlated with each other, and a method for effecting this correlation has been devised.

It seems probable that further experiments, using these two types of apparatus, may yield information of use in the evaluation of coking coals, the practice of blending, and in the choice of oven width and rate of heating for a given coal; the standardization of conditions in the two experiments, and the examination of a number of coals of known coke-making and gas-producing qualities under full scale conditions, are therefore being actively pursued.

Further work on the blending of coals has been carried out. Blends of Cumberland, Durham, Northumberland, and Scottish coals have been prepared, and it has been found that the quality of the coke, as judged by the shatter test, may be improved by carefully regulated blending.

Two series of tests, in which cokes made from the same Durham coking coal, have been quenched (*a*) with water and (*b*) with dilute ammoniacal liquor, suggested that the shatter index of the coke might be slightly lowered by liquor-quenching, but showed that the behaviour of the two types of coke in the combustibility test was identical. Liquor-quenching did not affect the size of the coke or its colour, or its behaviour in a domestic grate; and it was concluded that the quenching of such a coke with liquor was not likely to affect adversely its properties for metallurgical or domestic use, or for use in the production of water gas.

* Northern Coke Research Committee, Annual Report No. 2.

Thermal Ratings for Domestic Gas Burning Apparatus

"A practical system of thermal rating for the various pieces of domestic gas apparatus will be a welcome addition to the Gas Industry's armoury of competitive weapons"

By R. D. KEILLOR, of Greenock.

The National Gas Council's recommendation, stating that should any Gas Undertaking propose to employ a small Gas Unit one of 4000 B.Th.U. should be adopted and that the small unit must, of course, be additional to the therm and not in substitution therefor, extends to the Gas Industry a desirable opportunity to further its modern aggressive and progressive sales policy.

Unfortunately, gas appliance manufacturers have in the past not been able to use a standard system of thermal rating owing to the absence of a recognized standard of measurement for the hourly emission of gaseous energy of such magnitude that it could be applied to the various pieces of domestic gas apparatus in general use. Now, however, the National Gas Council have made a recommendation that will enable the manufacturers to put this much needed businesslike system into operation. For rating purposes it may be taken that there is a certain thermal input of gaseous energy per hour to each piece of gas apparatus which at a given pressure yields the maximum efficiency of performance irrespective of the calorific value of the town gas supplied to the burner. An idea of the practical application of the additional gas unit to the thermal rating of domestic appliances will be seen from the following examples:

(*a*) A certain lighting burner gives its maximum efficiency of performance at an input of 2000 B.Th.U. per hour so that it may be known as a "Half-unit" burner and may be stamped and catalogued accordingly.

(*b*) A certain boiling burner operates at 8000 B.Th.U. per hour and may be officially known as a "2-unit" burner.

(*c*) A certain gas fire requires 20,000 B.Th.U. per hour to maintain the radiants at the required temperature and may be known as a "5-unit" radiant fire.

The question of arranging the volumetric input of gas to maintain the rated thermal capacity of any one of these appliances should not present any difficulty when it is realized that an alteration of *plus* or *minus* 50 B.Th.U. in the calorific value of the gas would only represent a difference of *plus* or *minus* 1 c.ft. for each unit of the hourly rating on the appliance. For example, if a gas fire were rated at 5 units then it would be set to pass 40 c.ft. of 500 B.Th.U. gas; 45 c.ft. of 450 B.Th.U. gas; 50 c.ft. of 400 B.Th.U. gas, and so on. Table 1, which is appended, shows the direct volumetric equivalents of the therm and the small unit, and it will be seen that for practical rating purposes the volumetric equivalents of the latter are only affected to a very small degree by changes in the declared calorific value of the gas.

The writer has already drawn attention in these pages to the advantage of getting to know a 500 B.Th.U. per c.ft. town gas as "8 c.ft. per unit" gas, just as a 470 B.Th.U. per c.ft. gas is "8·5 c.ft. per unit" gas, and so on; and when this procedure becomes common practice then the required volumetric input to any appliance of known unit rating will be obvious.

The principles outlined above are fundamentally practical and may be applied by the uninitiated just as easily as by the technical salesman. When the thermal rating of all pieces of gas apparatus is an accomplished fact even the employees of a gas undertaking, who may not be in touch with the current productions in gas appliances, will be in a position confidently to quote running costs after a glance at the rating on any appliance. Another salient feature of this scheme is that gas undertakers or private traders will not be so inclined unwittingly to overload service pipes and meter equipment by adding new appliances without regard to the extra load which will be thrown upon the existing equipment. To give thorough satisfaction each piece of gas apparatus must have its proper input of gaseous energy maintained, and when a stamped rating is absent this factor is generally dealt with in a most unsatisfactory manner, only too often being left to Providence. The running costs are arrived at by multiplying the unit rating on any piece of apparatus by the price of the gas per unit, and for those who find it necessary to convert an awkward price per therm to the equivalent price per unit of 4000 B.Th.U. Table 2 is appended.

TABLE 1.—*Cubic Feet per Therm and per Unit at Typical Declared Calorific Values.*

Gross Calorific Value of Gas.	C.Ft. per 100,000 B.Th.U.	C.Ft. per 4000 B.Th.U. Unit.	Ditto to Nearest Whole or Half Number.
400	250	10	10
410	244	9·75	
420	238	9·5	9·5
425	235	9·4	
430	233	9·3	
440	227	9·1	9·0
445	225	9·0	
450	222	8·9	
460	218	8·7	8·5
470	213	8·5	
475	211	8·4	
480	208	8·3	
490	204	8·1	8·0
500	200	8·0	

TABLE 2.—*Price per Unit of* 4000 *B.Th.U. from Pence per Therm of* 100,000 *B.Th.U. Advancing by Tenths (Including ¼d. and ¾d.).*

Price per Therm.	Price per 4000 B.Th.U.											
	0·0	0·1	0·2	0·25	0·3	0·4	0·5	0·6	0·7	0·75	0·8	0·9
d.												
1	0·04	0·044	0·048	0·05	0·052	0·056	0·06	0·064	0·068	0·07	0·072	0·076
2	0·08	0·084	0·088	0·09	0·092	0·096	0·10	0·104	0·108	0·11	0·112	0·116
3	0·12	0·124	0·128	0·13	0·132	0·136	0·14	0·144	0·148	0·15	0·152	0·156
4	0·16	0·164	0·168	0·17	0·172	0·176	0·18	0·184	0·188	0·19	0·192	0·196
5	0·20	0·204	0·208	0·21	0·212	0·216	0·22	0·224	0·228	0·23	0·232	0·236
6	0·24	0·244	0·248	0·25	0·252	0·256	0·26	0·264	0·268	0·27	0·272	0·276
7	0·28	0·284	0·288	0·29	0·292	0·296	0·30	0·304	0·308	0·31	0·312	0·316
8	0·32	0·324	0·328	0·33	0·332	0·336	0·34	0·344	0·348	0·35	0·352	0·356
9	0·36	0·364	0·368	0·37	0·372	0·376	0·38	0·384	0·388	0·39	0·392	0·396
10	0·40	0·404	0·408	0·41	0·412	0·416	0·42	0·424	0·428	0·43	0·432	0·436
11	0·44	0·444	0·448	0·45	0·452	0·456	0·46	0·464	0·468	0·47	0·472	0·476
12	0·48	0·484	0·488	0·49	0·492	0·496	0·50	0·504	0·508	0·51	0·512	0·516

It will be necessary to adopt a standard of pressure for the uniform thermal rating of pieces of gas apparatus; this standard pressure would possibly require to be the pressure behind the injector when the piece of apparatus under consideration is under full load. In these days of carefully regulated district pressures, service governing, and individual appliance governing, it is not beyond reason to

suppose that a pressure of fifteen tenths of an inch water gauge could be decided upon (and relied upon) as being a suitable standard. This matter, however, is somewhat controversial and is one towards which the appliance manufacturers will no doubt devote their attention now that the way is open for the adoption of a practical system of thermal rating.

Modern competition demands that full advantage be taken of the economic value of town gas, and those interested in the future prosperity of the Gas Industry, together with the all important appliance manufacturing industry, will appreciate that the additional advantages offered by the small Gas Unit are of utmost importance from the practical and psychological viewpoints, and these additional advantages should be exploited without loss of time.

FIFTY YEARS AGO

Glimpses into the Files of the "JOURNAL"

Lamplighting Extraordinary.

Street lamplighting upon a new principle is being tried in a part of New York, and, according to the "New York Herald," with complete success. The lamps in question are not supplied with gas, but with a fluid undescribed, save that it is stated to be a mixture of petroleum and naphtha. This peculiar liquid is said to give a soft, steady, and white light of about 15 c.p.; while the gas lamps, which are also said to give a dull, flickering, reddish light, are credited with only 9 c.p. The cost of the oil lamps is also stated to be only about one-third that of gas. During the day the lamp-flame is not extinguished, but is merely turned down very low, whereby the consumption of spirit is said to be reduced to such an extent that the expense of keeping a lamp going by day for a fortnight is not more than one cent! There is nothing said about cleaning and trimming these lamps, but the supply of fluid is provided by driving round a wagon from which the liquid is pumped up to the reservoir of every lamp. The pillars are of the usual height and distance apart, and it is the way in which the lamps are turned up at nightfall which forms the greatest claim to originality of the entire arrangement. The lamplighter is mounted on a fleet horse, and, being provided with a rod, he keeps his steed galloping between the pillars, and when opposite one of them the docile animal suddenly stops so as to allow his rider to manipulate a lever handle attached to the lamp; and the flame being thus turned up or down as required, the lamplighter again "urges on his wild career." How the other passengers along the scene of this daring act of horsemanship like to have the lamplighter charging across the roadway at intervals of 85 ft., or how the rider himself manages if a carriage happens to obstruct his way, are not told us by the newspaper reporter, who followed the man in a gig at a sharp trot. The style of lamplighting in question—to say nothing of the lamps themselves—certainly appears more suitable for a scattered outlying district than for even a moderately busy thoroughfare.

Amateur Engineers.

To judge by the multiplicity of instances in which their office is assumed, civil engineers as a body stand high in the estimation of their fellow-citizens. It is a deplorable fact, as hinted by Mr. George Livesey last year, when reading, before the British Association of Gas Managers, his paper on mistakes in the construction of gasholder tanks, that almost every gentleman who joins a board of gas directors or a corporation gas committee, after a useful and prosperous career as a washing-machine seller or tinman, considers himself a fully trained civil engineer, and as such undertakes the superintendence of the works manager. There are, indeed, few gas engineers who could not name from the list of their own acquaintance several men of this character; and in all cases they are objectionable, and frequently dangerous. If the manager or professional man consulted by the boards which they ornament is weak, or too good humoured, they will carry their own pet schemes over his head, taking all the credit of success, but in time of disaster throwing the blame on the designers or contractors for the work which they have contrived to spoil. These gentlemen generally appropriate tremendous praise to themselves for their extremely valuable services to the community, which, as a general rule, is passively willing to allow any man who occupies himself in the hardware trade to inscribe after his name those well known initials which many a man who has spent his lifetime in real field or constructive work shrinks from claiming by right.

An Improved Ammoniacal Manure.

A Company has just been formed with objects which will probably be of great interest to gas manufacturers. Lieut.-Col. Bolton and Prof. Wanklyn, working in conjunction with several well-known gas engineers, Mr. F. W. Hartley among the number, have for some time past been engaged at the South Metropolitan Gas Company's works in perfecting a process for the economical recovery of ammonia from crude gas, in the form of a solid manure or fertilizing agent. The process, which is patented, and of which the details will shortly be made known, is reported to be remarkably simple, and is intended to be applied in the course of the ordinary operations of the purifying-house, without special plant. Washing and scrubbing will, it is expected, be done away with in the new process, a considerable saving in plant being thus effected, in addition to which a common source of loss of illuminating power, due to the absorption of hydrocarbons in the scrubbers, will be avoided. The ammonia will be fixed in a dry form, sulphate of ammonia being procured together with phosphate of lime in its best state, the compound thus presenting all the characteristics of a perfect manure. The only labour needed to prepare the material for sale, after it is taken from the purifiers, is the slight service of pulverizing it in an ordinary disintegrator, whereby it is reduced to an impalpable soluble powder. It is also claimed that the process eliminates a considerable portion of the sulphur compounds, thus rendering it a highly desirable aid to the complete purification of gas. The Ammoniated Superphosphate Company is the title of the new venture, which starts with a highly influential list of subscribers, headed by the Right Hon. Lyon Playfair, C.B., M.P., and there is every reason to expect that it will speedily be in a position to transact an important business.

A Gas-Flame Microphone.

The application of a gas-flame to the transmission of sound appears at first sight inappropriate, if not fantastical; but it has been done with considerable success by M. Amsler, who has shown his apparatus at the recent Paris Electrical Exhibition. The phenomena of sensitive flames are well known, and it is even a matter of common observation that the best Argand burners used in the ordinary practice of gas lighting are apt to alter in length in consequence of the vibration of the air caused by simple noises. The correlative fact of the sensitiveness of gas-flames to variations of pressure, coupled with the known conducting power of flames for electricity, constitutes the principle of M. Amsler's gas-flame microphone. The inventor causes a gas-flame to pass between two fine platinum wires, which cross each other at a distance of about 1 millimetre, and the current traverses both flame and the wires. The vibrations of the human voice are concentrated in the usual way upon a metal diaphragm. This varies in pressure of gas at the burner, and thus causes a vibratory movement in the flame, which alters in conducting power, and takes the place of the carbon button in telephones of the usual construction. It will be observed that the arrangement is somewhat similar to a part of Prof. Bell's apparatus for the transmission of sound by light. It is also evident that the rightful application of the strange phenomena of sensitive flames has not yet been made, since M. Amsler does not directly avail himself, in the present instance, of the sensitiveness of flames to vibrations of the air; but he first renders the flame vibratory by causing variations in the supply of gas, and secondly utilizes these vibrations in the manner previously described.

New Gas Light & Coke Company Showrooms at - - - Harrow - - -

A description of the first of the two new showrooms opened by the Gas Light and Coke Company last week. The present premises were declared open by the Chairman of the Harrow U.D.C. on July 21. Next week a description will be given of the other—at Southall, opened on the following day

The new premises of the Gas Light and Coke Company in Station Road, Harrow, are in the centre of a large and rapidly developing area. An increase in the number of consumers in the district from 12,000 to 19,000 since the amalgamation of the Company with the Brentford Gas Company in 1926 has been reflected in a rapid rise in the amount of business transacted at the old showrooms in Greenhill Parade, St. Anne's Road, which were visited during 1930 by some 45,000 callers. In order, therefore, to handle satisfactorily this increasing volume of work the Directors decided to replace the old premises by new and up-to-date offices and showrooms where a wider selection of modern gas appliances could be displayed.

The district is essentially a residential one; building, which during the last few years has been carried out on a large scale, is still proceeding at a steady rate, and 99 p.ct. of the houses use gas for some purpose or other. But, in addition, the Company's activities in providing for the needs of industry are fully illustrated in a number of flourishing businesses which are carried on in the area. Messrs. Kodak, Ltd., use gas for furnaces and tool hardening, for heating spirit for coating the metal work of cameras, and for soldering. An important branch of the work of His Majesty's Stationery Office is carried on within the locality—namely, the production of the Post Office Telephone Directory, in which gas plays a leading part, being utilized for the melting of stereo metal and that used in linotype and monotype machines. Messrs. J. Lyons & Co. also have a factory at Greenford, where practically their entire output of chocolates, sweets, coffee, &c., is produced by the aid of gas. All three firms use gas extensively for the supply of hot water for baths and for catering in their canteens and at their sports grounds. Glassware, too, and brushes of all kinds are among the products of the district for which gas is of great importance. During the last ten years the annual consumption of gas in Harrow has risen by over 220 million c.ft., and there is every sign that this development will continue with equal rapidity.

Description of Premises.

In a three-storeyed building the ground floor is devoted to extensive showrooms. Following the usual practice of the Company the showroom window is of the " open " type, affording a clear view into the interior from the street. Entering by the street door, the first section is devoted to a display of attractive gas fires in suitable surrounds, while here also are two examples of gas cookers and boilers in a setting to take the place of the coal range. In the next section is a wide range of cookers of all varieties from the high-grade all-enamelled type to the smaller appliances in black finish. In the next section is the counter for the payment of accounts, &c., and beyond this is another section devoted to the display of smaller varieties of gas fire, while here also is a showcase exhibiting various smaller gas fittings. Further sections are devoted to washing machines, while there is an attractive model bathroom complete with every gas fitting, including a gas-heated linen cupboard with glass door.

The first floor is occupied by the district representatives and staff, and above this, on the second floor, a comfortable demonstration room has been built. Hitherto, a hall has been hired for the cookery lectures and demonstrations which have been so popular in Harrow; but it is felt that the new room, with a kitchen attached, will prove even more convenient.

The visitors were welcomed by Sir David Milne-Watson, LL.D., D.L. (Governor of the Company), with whom was Mr. R. W. Foot, the General Manager. There were also present the Secretary (Mr. W. L. Galbraith), the Chief Engineer (Mr. T. Hardie), the Accountant (Mr. H. E. Ibbs), the Rental Superintendent (Mr. L. M. Simmons), and the Controller of Gas Sales (Mr. Stephen Lacey), together with Senior Officers of the Gas Sales Department.

The opening ceremony was later performed by Mr. George H. Exeter (Chairman of the Harrow-on-the-Hill Urban District Council), who was accompanied by Mrs. Exeter, and was supported by Councillors and Principal Officers of the local Councils.

The Opening Ceremony.

Mr. George H. Exeter (Chairman of the Harrow-on-the-Hill Urban District Council), in the course of a few remarks before formally declaring the new premises open, said that he did not know really whether an apology was not due to the residents of this district for his having the audacity to accept from Sir David Milne-Watson the honour of being allowed to declare these wonderful premises open. It had been remarked in the town that it seemed very strange that he, as Chairman of the Urban District Council, should collaborate with the Directors of this Company. They (the Council), continued Mr. Exeter, were the trustees of the funds of this town on behalf of the ratepayers, while the Directors of the Gas Light and Coke Company were similarly trustees for their shareholders, and, naturally, they had got to look after the interests of those shareholders. The Gas Company had certain rights and powers, and so had the Council; they had both fought to get the best for all, and the Gas Light and Coke Company had met the Council very considerately on the question of camouflage of the holder.

They were delighted to have a showroom such as this in Harrow, went on Mr. Exeter, and he thought that great credit was due to the Architect, Mr. Walter J. Tapper; on behalf of the local authority, which represented the residents of the town, he congratulated the Company on the fact that they had put up such a fine building. It was needed in the town, and such a building was necessary for the ladies to come and see just what could be done by gas.

He went on to refer to the progress of the Gas Light and Coke Company and to the co-partnership and welfare work among the employees; and, in conclusion, Mr. Exeter remarked that this was not one of the least important functions during his year of office, and it was a very great honour to be called upon to declare these premises open to the public.

In Pursuance of a Policy.

Sir David Milne-Watson, in thanking Mr. Exeter for declaring the new showrooms open, also thanked him for his kind references to the Company. The erection of these premises was in pursuance of a definite policy—namely, in all their districts, extending from Southend-on-Sea to Windsor, to open showrooms of this character in the principal centres. In addition to their Head Offices in Horseferry Road, Westminster, where gas was originally manufactured in 1812, they had premises in other places, for they realized that time was of great value to their consumers, and they could not see all they should in the way of gas apparatus unless there were showrooms in all parts of the Company's area. Therefore they had built these showrooms here, which comprised a very beautiful building and was an ornament to the town of Harrow, while it made it possible to demonstrate all that gas was capable of doing to make life easier—especially for the ladies. They had here also accommodation for their staff; they had always studied in the Gas Light and Coke Company the wellbeing of their staff, and they had tried to give them comfortable places to work in; here this had been carried into practice. Sir David also referred to the co-partnership in the Company, remarking that the scheme was very flourishing, having been started in 1909, and they now had between 15,000 and 16,000 co-partners, holding some £850,000 of the ordinary stock of the Company.

In regard to the matter of the new waterless gasholder, Sir David said that they did not put a gasholder where it was not wanted. There would not have been any gasholder there today had it not been for the development of the district during the last few years. One had only to look round the countryside from the hill to see that there were no longer the green fields there used to be; the land was largely covered with dwelling-houses. These houses required gas, and so they had to erect this holder. In the course of time, remarked Sir David, this gasholder would not be considered the object of scorn it was at present, but would become one of the sights of the town. The question of colour had given the Directors and the Architect much thought, and they had visited the site many times with the Chairman and members of the Urban District Council. Finally, one of the residents had offered to prepare a sketch of a proposed colour scheme for the holder, and it had been decided to adopt that scheme.

Mr. Walter J. Tapper, A.R.A., Past-President of the Royal Institute of British Architects, was responsible for the design, arrangement, decoration, and furnishing of the offices and showrooms.

LANDSCAPE LIGHTING—A NEW "FIELD?" - - -

How St. James's Park was transformed by a remarkable application of Gas Lighting

Lighting experiments of great interest were carried out on the evening of Tuesday of last week. They were witnessed by Their Majesties the King and Queen from the balcony of Buckingham Palace, as well as by a vast and admiring throng. The experiments were in connection with the proposed scheme of lighting to celebrate the forthcoming International Illumination Congress, a portion of the proceedings at which will be staged in London next September. During the Congress meetings it is intended to floodlight Buckingham Palace, the County Hall, the National Gallery, St. Martin's Church, and Somerset House, in addition to Westminster Abbey and the Houses of Parliament. The gas and electricity industries are co-operating in what—judging from the "trial run"—is destined to be a feature of more than passing importance. Already it has enabled the Daily Press and a large section of the public to appreciate that gas is adaptable as a modern scientific lighting agent.

As far as gas is concerned, on the occasion last week attention was devoted to landscape lighting in St. James's Park, for which spectacular and highly successful effort the Gas Light and Coke Company were responsible. This is what "The Times" said about it: "Then the gas lighting of the park was brought into the picture. The park gates were closed, but from the semi-circle by which the Mall is linked with the front of the Palace glimpses could be obtained of the loveliness of trees and flowers and ornamental water bathed in soft but revealing light. The illumination gave a fresh aspect to one of the most beautiful views in London, and at the same time inspired a hope that later in the year the whole of the park and the Government buildings beyond may be brought within the scheme to provide a picture which no other capital city in Europe could present to visitors. It was noted that the lighting brought out the natural colour of flowers, but gave a fairy-like effect to trees."

The photographs convey something of the general effect of this landscape lighting, which was effected by 58 lamps. Four different types of gas lamp were used to bring about the various effects.

For the lighting of the upper foliage of the taller trees the lamp shown in fig. 1 was used. The lamps are fitted with either 12 or 6 cluster mantles arranged in line. The reflecting surface is of staybrite steel, and is adjustable so that a broad shallow beam can be projected at an angle of approximately 45°. With these lamps it is possible to throw a beam to illuminate a tree 80 ft. in height.

Fig. 2 is a photograph of a type of lamp similar to that shown in fig. 1, but the adjustable reflector is designed for illuminating the lower half of the taller trees.

The island shown in the photograph, and the flowers in the foreground were lighted by 12-lt. superheated cluster lamps with mantles in circular formation and fitted with special parabolic reflectors for concentrating the light (fig. 3). These lamps can be rotated, and the reflectors raised or lowered as occasion demands. In addition, a square type of lamp was used for lighting the lower shrubs (fig. 4).

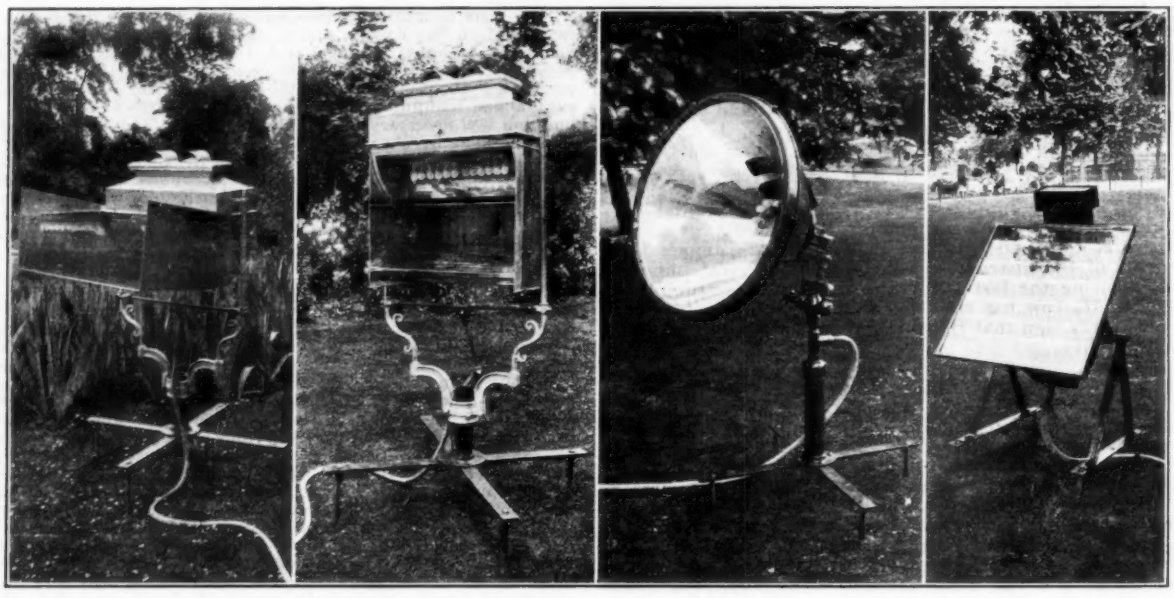

FIG. 1. FIG. 2. FIG. 3. FIG. 4.

EQUIPMENT USED FOR LANDSCAPE LIGHTING BY GAS IN ST. JAMES'S PARK.

The reflectors were designed by the technical staff of the Gas Light and Coke Company, co-operation being given by Messrs. W. Sugg & Co. and Messrs. Foster & Pullen, Ltd.

The experiment justified the extension of the work for the Congress in September. In September the flower beds seen from Bird Cage Walk and the Foot Bridge will be illuminated by specially equipped lamps arranged some 12 ft. above ground level. These lamps will have reflectors giving a beam of some 4000 candles measured at about 20° below the horizontal. In addition a new type of reflector has been developed, and this will be used as occasion demands for the various types of work.

THE GAS LIGHTED FAIRYLAND DESCRIBED ON THE OPPOSITE PAGE.

NOTES ON PLANT AND PROCESSES

Thermo-Electric Pyrometers.

The Cambridge Instrument Company, Ltd., have published a new list in which are described and illustrated the latest forms of their thermo-electric pyrometers.

Among the new features is a patented method of supporting the moving system of the pivoted type indicators. The whole movement, together with its pivots, is held magnetically in the field of the galvanometer magnet, so that the movement "floats," as it were, on what is virtually an air cushion. This patented feature secures a degree of resiliency and resistance to shock which cannot be obtained by any other known method, such as the use of springs, &c.

A further development is the provision of automatic cold junction compensators in the indicators and recorders, rendering it unnecessary to note the cold junction temperature or to adjust the zero.

Aluminium in Architecture and Decoration.

The application of aluminium in various features of interior decoration has long been practised, though until recently to a comparatively small degree, and the present vogue is the result of the growing recognition by architects and designers in general of a principle already practised by early workers. It was in pre-war days, for example, that the designers of the "Mauretania" chose aluminium as the material for the decorative grill work enclosing the lift shaft; while for an example of the use of aluminium for exterior purposes one can go as far back as 1893, when this metal was chosen for the statue of Eros in Piccadilly Circus. It is true that the smoky atmosphere of London in the "nineties" quickly gave Eros his coating of soot and obscured the beauty of the metal itself.

A most attractive brochure by the British Aluminium Company, Ltd., of Adelaide House, King William Street, E.C. 4, deals with the application of aluminium for decoration purposes and illustrates a number of examples of very beautiful decorative work embodying the use of aluminium in one form or another.

At the present time it is in the New World that the highest development of this application of aluminium is to be sought, and many of the illustrations in this brochure are of buildings in Canada and America. Nevertheless, the new note in design which is provided by aluminium spandrels or cresting, or cornices or statuary, is equally applicable to modern buildings in this country, as some of the illustrations show. Especially impressive effects are obtained with the white of the light grey metallic surface of aluminium arranged to stand in contrast with grey stone, and though no photograph can adequately convey a true impression of the result obtained, the illustrations in this remarkably fine publication at least suggest the possibilities of this modern form of decoration.

It may be mentioned that among the buildings employing aluminium decorative work illustrated in the brochure is a showroom of the Consumers' Gas Company of Toronto, which affords a striking example of this attractive form of architecture.

Fractional H.P. Motors.

Four types of fractional horse-power motors are described in a booklet recently published by the British Thomson-Houston Company, Ltd., of Rugby, each of these types having special features of design making it best suited for particular duties.

The range of motors described includes not only those for D.C. circuits, but also split-phase and repulsion—induction motors for single-phase circuits, and Universal motors for use on both A.C. and D.C. circuits.

After stating the advantages and distinctive features of each of these types of motor, the booklet goes on to describe the methods of manufacture and the great care and attention to details carried out at the Company's Coventry factory. This factory is up-to-date and equipped with many machines specially designed to cope with this line of manufacture. Wherever possible, the conveyor system has been made use of to eliminate handling and to speed up production. A description of the factory process is given, together with illustrations showing various stages in the manufacture and subsequent testing of the motors. Dimensions and specifications of the various types of motor are given.

Whether the installation demands a motor for day and night operation or for the onerous duty of frequent and heavy starting, concludes the booklet, the B.T.H. motors will meet the requirements. They have been used in practically every application throughout the world—from the juvenile pleasure boats on our coasts to the sheep farms of New Zealand.

Monel Metal in Food Service Equipment.

An interesting leaflet has been published by Messrs. Monel-Weir, Ltd., of Cathcart, Glasgow, indicating some of the applications of monel metal to food service equipment. Illustrations show the very attractive appearance of this product when utilized in soda fountains, cafeterias, ice cream freezers, bars, counters, and so forth. Apparatus such as coffee percolators, dishwashers, &c., are also finished in monel metal and provide a very pleasing appearance.

THE "JOURNAL" TECHNICAL RECORD

Which contains Full Reports of Meetings of Gas and Allied Associations

Gas Institute of New Zealand

SEVENTH ANNUAL MEETING AT DUNEDIN

PRESIDENTIAL ADDRESS

of A. COUPER, Engineer, City of Dunedin Gas Department.

[EXTRACT.]

I have decided to give a brief review of the Dunedin Gas Department's operations since its inception, touching more particularly the site on which the Works are situated, and the ultimate steps taken to counteract the conditions of the subsoil. In the first records of the Works, I find that a Company was formed in July, 1862, called the Dunedin Gas Light and Coke Company, and that the streets of Dunedin were first lit in May, 1863. This, I understand, is the earliest record in which gas was used in the Dominion; Christchurch followed in 1864, Auckland in 1865, and Wellington in 1869. The price then charged per 1000 c.ft. was 20s. This price was ultimately reduced, after long agitation, to 12s. 6d. per 1000 c.ft.

The site on which the Works stand comprises 5¼ acres, and is evidently a sea reclamation, this particular part being evidently the remains of a deep swamp, the ground being of blue silt with shells, and soft, quite unsuitable for the erection of heavy brick buildings unless specially treated. No record, however, has been kept of the nature of the foundations in the early buildings, but all the buildings and plant settled considerably, which did not tend to good results being obtained from the plant, owing to the undue and unequal settlement. No doubt the steps then taken to counteract the nature of the ground were considered sufficient, but did not turn out to their satisfaction.

In 1870 the number of services and meters in use numbered 350; in 1875 the number had increased to 752. In 1876 the City Council purchased the Dunedin Gas-Works for the sum of £50,000. Very little record has been kept of the early operations of the Department. In 1877 the total gas made was 36,112,500 c.ft., showing a steady increase to 1881, when the gas made was 60,180,000 c.ft. In 1882 further additions were made to the plant in the form of 7 settings of five retorts each, and in 1900 a further 3 settings of eight retorts each were built. In both cases undue settlement took place, which gave much trouble in operating the benches. No record, however, was kept of the nature of the foundations in either case, but when this portion was dismantled at a later date it was found that no provision had been taken to cope with the nature of the subsoil, as it was neither piled nor in the form of a raft foundation.

In the year 1900 the output of gas had risen to just on 84 million c.ft., and in 1907 the Department went in for considerable extensions to plant. A new retort house was erected, containing 13 benches of eight 20-ft. through retorts, together with the necessary mechanical plant in the form of De Brouwer discharger and charger, and of the conveyer for handling the coke discharged; coal store capable of storing 2000 tons of coal, and also a new gasholder capable of storing 1 million c.ft. of gas. In this instance piled foundations were put in. In the case of the gasholder, the bearing weight on the ground was 19 cwt. per sq. ft., which is not an excessive weight for any ground to carry. Twenty-foot piles were used with 5-ft. centres. However, after the gasholder had been in commission for about 18 months it was found that, owing to the unequal resistance of some of the piles forming this foundation, they had evidently fractured the concrete crown of the foundation and finally fractured the bottom plates of the holder itself, allowing the water in the tank to escape.

Various steps were taken to remedy the matter, but of no avail. Ultimately, the holder was put out of commission, dismantled and re-erected on another site away from the Works, which proved a very costly job for the Council. As regards the retort house and coal store, which were also piled, the settlement was gradual, but after a few years it was found that it had actually settled to the extent of 2 ft., in the vicinity of the chimney, which was situated midway in the retort house, having 6 benches of eight retorts each on one side and 7 benches of eight retorts each on the other, the settlement tapering away to both ends of the building. This would naturally be caused by the extra weight of brickwork forming the chimney.

THE RESULT OF SUBSIDENCE.

You will readily understand what this meant in operating our retort benches. It necessitated the constant relevelling of the hydraulic mains which were not fitted with adjustable dips; it also caused displacement in the benches themselves, which were of the regenerative system, causing shorts in the various secondary and waste-heat flues, and thus preventing anything of a reliable nature being obtained as regards heat.

From 1924 it was found necessary to add to our existing plant to cope with the steady increase in our output. A new station meter, capable of handling 100,000 c.ft. per hour, to replace our existing one which was then taxed to its limits; new purifiers, Livesey washer, and condensers all capable of treating 1,500,000 c.ft. of gas per day; and new stores and workshops were also erected, the latter comprising new meter shop, carpenter's shop, and stores.

The Department does all its own meter repairs, and is now carrying out a most intensive overhaul of all its meters, with the idea of bringing them all up to date. In some instances it was found that some of the meters had been in continuous use from 30 to 40 years, and in a great many cases detrimental to the Department's revenue, at the same time going to swell the unaccounted-for gas. Conditions on the Works site have improved considerably as regards drainage, &c., and in 1925 the question of Works extension again came up for consideration by the Council. It became a question of whether it would be necessary to remove the Works to another site or whether a suitable foundation could be prepared to meet the existing conditions of subsoil and ensure success. This matter was carefully gone into and various sites considered, with the result that the only suitable one available proved to be at the other extreme end of our city, which meant that independent of erecting a new Works with railway access and also the necessity of having to construct a wharf for taking delivery of sea-borne coal, there was the question of laying larger trunk mains from that end of the city, altogether an expenditure of between £200,000 and £300,000, which would have handicapped the Department for quite a number of years as regards interest and other charges on such an expenditure.

It was therefore decided by the Council to take expert advice on the matter as to whether suitable foundations could be put in to cope with the existing conditions of subsoil and be guaranteed against failure. A shaft 4 ft. square was sunk to the depth of 50 ft., and a bore of another 30 ft. put down. Another bore was put down to 650 ft. The first 150 ft. showed nothing but harbour silt, then a layer of vegetable matter for 15 ft. thick, then back on to the harbour silt for the balance, when the bore was stopped. As regards the shaft sunk it was found on drawing the various lengths of timber forming the shaft which consisted of 4 ft. lengths, the surrounding soil filled up the void from the bottom without a shovelful being filled in, and it continued to do so until within 30 ft. of the surface, when it stopped; the remaining 30 ft. was then filled in by hand.

This will give you some idea of the existing conditions. After going fully into the question, the expert engaged to report on the matter, taking into account the past experience of the Department and the existing conditions, reported that if it were permissible to increase the area of the foundations to bring down the bearing weight to 10 cwt.

per sq. ft., a cellular raft foundation could be made, which could be guaranteed against failure on the present site of the Works. This only required an increase of 10 ft. all round on the foundation plan first submitted by the makers of the vertical retort plant.

The Council therefore agreed to carry on, on the present site. Plans and specifications were then prepared by the expert, the overall size of the foundations being 79 ft. by 75 ft. comprising 49 chambers. In the first instance the area occupied by the main foundation was sheet-piled with concrete piles 10 ft. long, driven down 4 ft. 7 in. below the ground level, the total depth of the raft foundation itself being 6 ft. 3 in., the idea being that the main raft foundation would require to overcome 14 ft. 7 in. of outer resistance before any settlement took place on the foundation itself, further than squeeze the water element out of the ground occupied by the foundation itself, and so consolidate the ground more. The main foundation was totally independent of the sheet-piling having the surface of the sheet-piles covered with malthoid, to prevent sheet-piling adhering to outer surface of raft beams. After the sheet-piles had been driven home and the internal area excavated to the required depth, 2 in. of concrete was first laid down to seal the surface, followed by the main reinforcements metal consisting of 1½ in. indented round steel bars, so placed as to form part of the walls of the various chambers and embodied in the bottom thickness of concrete which represented 9 in. thick; embodied also in the bottom slab were minor reinforcement rods of ⅜ in. diameter spaced every 6 in.

The walls of the chambers were also reinforced with special shape reinforcement bars 1½ in. thick, designed to counteract any compression that might take place, combined with the minor reinforcement rods as in the bottom slab, and spaced the same. The centre walls were 26 in. thick which were to carry the major portion of weight. The outer walls were from 15 to 19 in. thick. Again on the top slab the same nature and class of reinforcement was used as on the bottom slab, the thickness varying from 7 to 14 in. The conditions of the specifications were very specific and no latitude was allowed the contractors to deviate from them. At the commencement of excavating, levels were taken to check the effect on the existing buildings, as the excavations in connection with the grabber and breaker pits came so close on to the foundation of the existing buildings, and of such a depth (20 ft.) that I naturally wanted to see the effect. However, no settlement took place; then as the raft foundation and the structure thereon proceeded levels were taken from time to time to check what settlement was taking place. This showed a certain amount of settlement which was naturally looked for, but which gradually slowed up and has now practically stopped, as I have already mentioned. I fully expected this owing to the gradual compression on the ground squeezing out the water element and so consolidating the solid matter. I may state that the settlement has been on a level base and has in no way interfered with any section of the plant.

The total settlement of the foundation is slightly over 3 in., which is quite satisfactory. The plant erected on this foundation consists of 24 retorts of 3 tons capacity, latest model, per day of 500 B.Th.U. gas, also wagon tippler, coal breaker, and gravity bucket elevator in two pits adjacent to the main foundations. I cannot speak too highly of this plant, my experience being that one has far greater control of one's make and quality than with the horizontal retorts. It is necessary to give careful attention and supervision to the regulation of heats, but when carried out on a systematic method it more than repays the special attention.

The saving alone in our case in labour represented considerably more than £2500 per annum, only requiring two operators per shift in place of five. One other point which carries a lot of weight in favour of vertical retorts is the fact that a much smaller area is required for the plant in comparison with the horizontal system; this means a lot when ground area is limited.

In 1929 it became necessary to consider the erection of a new gasholder on the Works to replace one of the smaller holders which had been in continuous use for 52 years and which had previously been in use at Croydon, England, before that, owing to its condition being too costly to repair, and also being too small for our present day requirements. It was ultimately decided to erect a holder of a capacity of 500,000 c.ft. The design of the foundation for this holder is on the same principle as the retort house foundation, being a cellular raft designed by the same expert, to carry the same weight, 10 cwt. per sq. ft. This foundation has now been constructed on our Works and is a cellular raft foundation of octagonal shape.

The gasholder is by the firm of Messrs. Firth Blakeley, Sons, & Co., Ltd., Church Fenton, Leeds, England, who are now erecting same on the site. It consists of a three-lift column-guided holder.

For the year ended March 31, 1930, this Department showed its largest increase in gas sales with one exception. The progress of the Department in recent years, in spite of keen competition from the Electrical Department, has been most encouraging, and shows no signs of falling off, as to date we are now showing a considerable increase in sales over last year's figures.

OIL FROM COAL.

By W. A. Joiner, M.Sc., A.I.C. (Wellington).

[Extract.]

It will be unnecessary to describe here the principles involved in the distillation or carbonization of coal at low temperatures. A great variety of low-temperature carbonization plants has been designed, and comparatively few of these have reached full scale working dimensions. The choice of such a plant must always depend on the material to be treated and on the products which are desired, which in turn must be determined by local conditions. The product obtained in greatest amount is, of course, the carbonized residue or semi-coke, but it is the tar-oil with which we are concerned in this paper. The yield of tar-oil is at a maximum when the coal is treated at temperatures of about 500-550° C. The yield is also considerably dependent on the design of the plant, and it is essential for maximum production that the tar vapours be removed as quickly as possible from the action of high temperatures. Under average conditions, 15 to 25 gallons of tar-oil may be expected from one ton of coal, although some types of coal may give considerably higher yields.

True low-temperature tar or primary tar differs considerably in chemical composition from high-temperature tar produced with horizontal retorts. Vertical retort tar occupies an intermediate position. In low-temperature tar, aromatic hydrocarbons, such as benzene, toluene, xylene, naphthalene, &c., are absent, or almost so, and there is usually present a characteristically high percentage of tar-acids or phenolic compounds of a complex nature. It has been stated that low-temperature tar is similar to crude petroleum, but some authorities are disinclined to agree with this. On the whole, it must be regarded as inferior to natural petroleum, and at the present time, apart from the lighter fractions, its chief use would appear to be as fuel oil. The tar acids are of low fuel value, and it may be worth while to separate these if a suitable application can be found for them. That it is possible to increase the yield of lighter fractions at the expense of the heavier has been shown by the application of cracking and hydrogenation to low-temperature tar-oils. Cracking has so far given rather disappointing results, but those achieved by the use of hydrogenation are most promising. The hydrogenation of tar-oil from brown coal is being carried out on a fairly large scale by the I.G. Farbenindustrie in Germany. In a recent report a description is given of this Company's plant at Merseberg.

This installation is said to be producing 85 p.ct. motor fuel and 15 p.ct. non-condensable gases from brown coal tar-oil. The hydrogenation takes place in two stages. The coal-oil, mixed with a small quantity of catalyst, is pumped at 3000 lbs. per sq. in. through heating coils, which raise its temperature to 800° Fahr. (427° C.) into the reaction chamber. This chamber consists of an insulated vertical tower, 58 ft. high and 30 in. in diameter. Here it meets the hydrogen also pre-heated, and at the same pressure, and during reaction the temperature rises to 850° Fahr. (454° C.). The treated oil and hydrogen then pass through a cooling coil, the gas is separated, and the oil flows to a still at atmospheric pressure. This completes the first stage of hydrogenation, after which the resulting oil is distilled into three fractions.

The residual oil is re-circulated with fresh tar through stage one, and the intermediate fraction passes on to the second stage. Here the oil and hydrogen are pre-heated and raised in pressure as before, and react in a similar chamber in which a catalyst is suspended. The temperature in this stage rises to 950° Fahr. (510° C.), during reaction. The oil is then cooled, and passes to the distillation plant with the material obtained from the first hydrogenation of tar and residual oil. The crude gasoline is treated with 98 p.ct. sulphuric acid, neutralized and washed, and is then fractionated into gasoline with an end point of 392° Fahr. (200° C.). For every 100 lbs. of coal tar-oil 8 lbs. (or approximately 1500 c.ft.) of hydrogen are used, and 0·5 p.ct. of catalyst is mixed with the oil before it enters the first stage. When worked for motor-spirit, this plant does not produce lubricating oils, but by using appropriate catalysts and lower pressures lubricating oils may be recovered. The plant consists of 32 units, each with a capacity of two tons or 14 barrels of raw material per hour.

A Fuel Research Committee.

Towards the end of 1927 a Fuel Research Committee of the New Zealand Council of Scientific and Industrial Re-

search was formed, and among other activities of this Committee an examination of the behaviour of New Zealand coals on low-temperature carbonization is being carried out at the Dominion Laboratory.

The experimental retort, which takes a charge of 35 lbs. of coal, is a gas-fired rotary, one of the design used by Fischer in Germany. The apparatus for the recovery of the products of carbonization has been modified and augmented in order to get as complete a recovery as possible.

The yields obtained from some sub-bituminous or "brown" coals at 600° C. were as follows:

Yields per Ton of Coal

Coal.	Rotowaro.	Kaitangata.	Linton.
Carbonized residue, cwt. .	10·5	10·2	11·2
Tar-oil, galls.	16·6	17·6	14·7
Liquor, ,, ...	58·3	66·7	56·7
Gas, c.ft.	4216	3721	3891
Light spirit from gas, galls. .	1·2	1·1	0·8

The tar-oil produced the following, calculated on one ton of coal:

1 Ton of Coal.	Rotowaro.	Kaitangata.	Linton.
Hard pitch, lbs.	49	57	44
Light oil over 200° C., galls.	2·2	1·9	1·7
Neutral oil over 200° C., ,,	7·1	6·7	5·5
Crude tar acids, galls. . .	2·4	3·5	3·3
Crude tar bases, ,, . .	0·2	0·1	0·2

Bituminous coal from the Millerton Mine has been similarly treated and gave approximately 25 gallons of tar-oil per ton. This oil differs from the tar-oil obtained from sub-bituminous coals in being quite fluid at ordinary temperatures owing to the reduced percentages of waxes. Blackball coal is at present being similarly examined. In the case of some Reefton coals which were submitted to the standard Gray-King Low-Temperature Assay it was found that the yields of tar-oil varied from 28 to 37 gallons per ton. In practice, the yield might be expected to be from 60 to 80 p.ct. of this, but in any case these coals show remarkably high yields.

The foregoing brief review has shown the possibilities of converting coal into oils, and although commercial exploitation has not yet proceeded very far, particularly in connection with the hydrogenation and synthetic processes, we may expect before long to see some of these established in those localities where there are abundant and cheap supplies of raw materials. It is possible to make coal produce oil which, in many instances, can be made to take the place of petroleum products, but at the present time it is a fairly costly business to treat coal solely for the production of oil. The cost of a hydrogenating plant is very great, and owing to the high pressures and temperatures employed, maintenance charges would be of a high order unless future research can provide materials which will withstand prolonged treatment under such rigorous conditions.

In Germany, where, as has been previously mentioned, a considerable amount of coal-oil is produced, economic conditions are different from those in many countries. The brown-coal from which this oil is chiefly prepared can be mined at a very low cost, much lower than would be possible for pit-coal.

Large sums have been spent by the I.G. Farbenindustrie on the investigation of hydrogenation, and it is significant of the importance of this subject that an arrangement has been made between this Company and the Standard Oil Company of New Jersey for the exploitation of hydrogenation processes outside Germany by a Company known as the Standard-I.G. Recently Imperial Chemical Industries, Ltd., have reached an agreement with the Standard-I.G. in connection with the development of hydrogenation, and in the last annual report of Imperial Chemical Industries, Ltd., it is stated that great progress has been made by that Company in the conversion of coal into petrol and fuel oil by hydrogenation, and that a semi-technical plant is in operation and is to-day producing first-class petrol from British coal.

The manufacture of oils by synthetic methods is not yet, so far as is known, a commercial process, although considerable quantities of methyl alcohol and similar substances are being produced commercially by this means. Owing to the flexibility imparted by the use of different catalysts, it should be possible to produce a variety of organic compounds of great value to chemical industry, and it is along these lines that one might expect future development to take place.

The case of low-temperature carbonization is perhaps a little different, for this process aims primarily at the production of smokeless fuel or semi-coke to combat the smoke nuisance in large cities, or to enhance the value of coals of low calorific power. At the same time, however, if low-temperature distillation becomes an established industry, considerable amounts of coal-oils will become available, and it is of the utmost importance that the industrial applications of such oils should be investigated in order that they may be made to yield the highest possible financial return. Ordinary methods of coal-tar distillation will not be altogether suitable, and it is here that hydrogenation processes will be usefully applied.

Wales and Monmouthshire Junior Gas Association.

Visit to Messrs. Stewarts & Lloyds' Works.

As in past years, the Wales and Monmouthshire Junior Gas Association arranged a summer visit, and this year took the opportunity of visiting the Coombs Wood Works of Messrs. Stewarts & Lloyds, Ltd., at Halesowen, nr. Birmingham. The visit took place on Thursday, June 11, and the journey was made by motor coach. On the way, a stop was made at Worcester, when members visited the fine old Cathedral.

After lunch, the party proceeded on their journey, and upon arrival at Halesowen were met by Mr. Stewart Howard.

Coombs Wood is one of the largest individual works owned by Messrs. Stewarts & Lloyds, Ltd. It is situated on the edge of the Black Country, between the towns of Halesowen and Blackheath.

The works, which cover approximately 30 acres, employ some 3000 men, and are chiefly engaged in the production of buttweld wrought-iron and steel tubes, wrought fittings, solid-drawn tubes, and large tubes and bends for high-pressure steam main work. In addition to this, they manufacture a large variety of tubular specials, such as coils and railway brake tubes, gas cylinders, &c., and have a large galvanizing department.

In the buttweld process, tubes up to 2-in. internal diameter are made, in both iron and steel, by the most up-to-date methods. Strip is mechanically charged into the furnace, heated to the required temperature, and drawn through dies into tubes. After this the tubes are carefully sized, straightened, and allowed to cool slowly.

The steel is manufactured by the Company's own steelworks at Bilston, and the iron strip is also an all-British product made to the I.G.E. Specification.

After the tubes leave the cooling rack they are conveyed to the cutting and screwing machines, where the waste ends are first cut off, and the tubes screwed, and from here they go to the proving pumps, where each tube is tested under hydraulic pressure and hammered at the same time.

The works make a speciality of catering for the requirements of gas undertakings, and have erected a special shop where all the screwing, testing, &c., for these undertakings is concentrated, special care being taken to ensure that the products are up to the high standard so necessary for tubes and fittings used by the Gas Industry.

They also have the most up-to-date air testing plants, where tubes can be tested by air in addition to the usual hydraulic test. Particular attention has been paid to the coating and wrapping of tubes, and a large amount of research work has been devoted to attain the most suitable form of protection against the varying conditions of corrosion which the tubes may have to withstand. A constant check is kept by the laboratory staff on the physical and mechanical properties of both the raw material and the finished product.

The plant for producing solid-drawn tubes has been installed within the last three years, and is one of the most up-to-date plants of its kind in the world. It is capable of making tubes up to 6-in. internal diameter, and the method of manufacture is known as the "push bench." In this process a billet, which has previously been pierced in a press, is forced through a series of die rings, and the resulting tube, which is then sized, cooled, and straightened, passes to the various finishing processes required for its completion.

There is a large variety of electric welding done, chiefly in connection with the steam mains department. All types of outlets and flanges which have to withstand high steam pressures and temperatures are welded on by highly skilled welders.

After the inspection, the members were entertained by the firm at tea. Mr. C. H. COLLINS, President, proposed a hearty vote of thanks to Messrs. Stewarts & Lloyds, Ltd., for the opportunity of viewing the works and for the kind hospitality displayed. This was seconded by Mr. C. B. FELTON (Newport); and Mr. STEWART HOWARD suitably responded.

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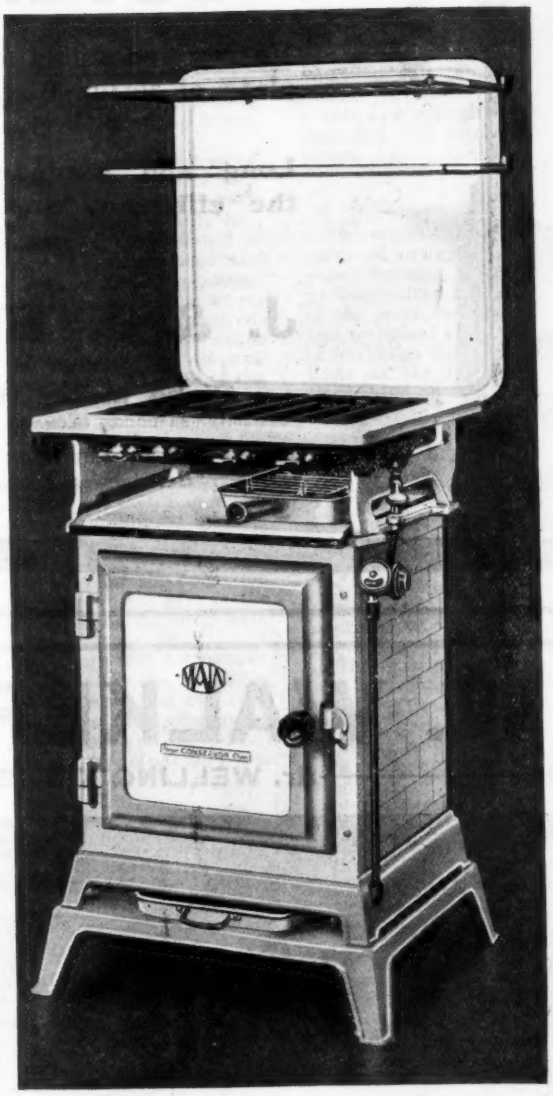

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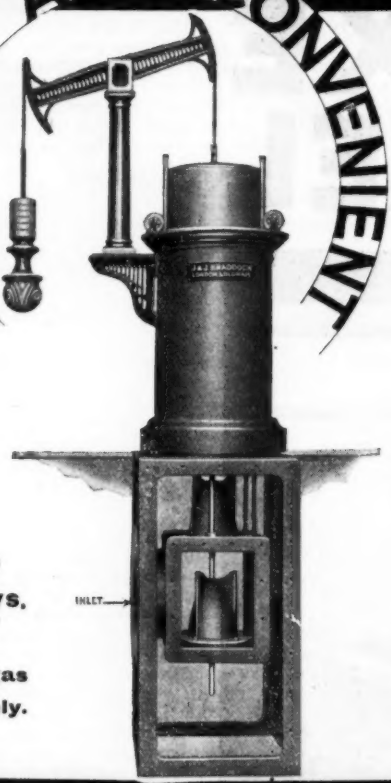

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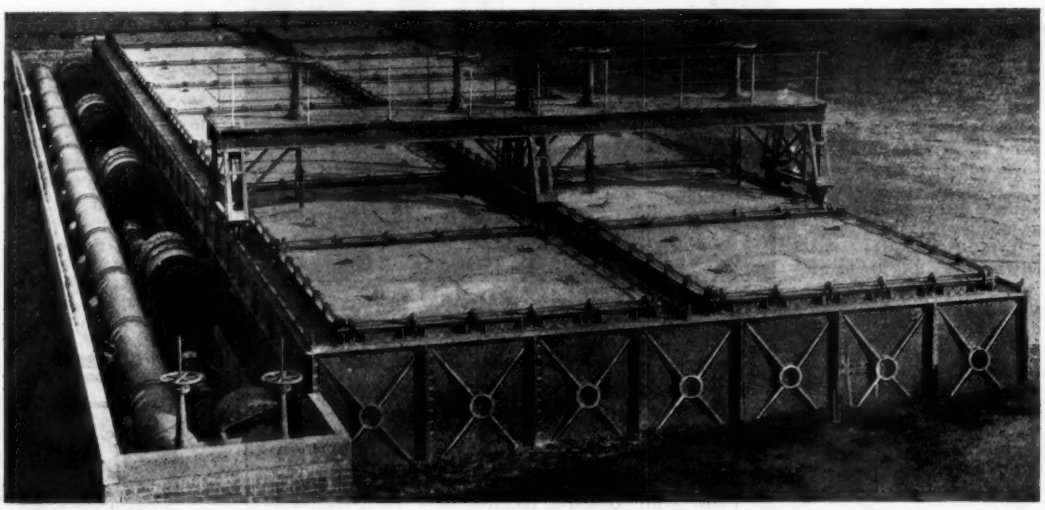

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Marketing Large Volume Water Heating*

By C. H. LIGHT, the People's Gas Light and Coke Company, Chicago.

The interest of most gas companies in volume water heating is comparatively recent, first because of its highly competitive nature, and, secondly, for the further reason that rates in the past have not justified any concerted effort directed toward the acquisition of this business.

The rapid growth of the gas house-heating business, with its high winter peak load, however, has caused many companies to examine carefully their market and their rates, in an effort to discover some class of business with which, at least partially, to fill up the summer valley that now characterizes their annual send-out, and which is becoming more and more accentuated with the growth of the house-heating business.

Volume water heating offers, I believe, without question, one of the most desirable classes of business from the standpoint of the summer load. The office building, apartment house, bank, hospital, hotel, industrial plant, &c., constitute but a small list of the prospects to be found in any community. All of these and many others need and use hot water in large quantities, and, generally speaking, the cost of this hot water service with crude fuel is at its peak during the period when space heating is not required.

It must not be inferred that the field for volume water heating is in any way solely limited to summer or off-peak operation. There are many buildings where, because of the peculiar advantages of gas, the nature and character of the service are of far more importance to the occupants than the cost of the fuel for such service. Banks and co-operative apartment buildings are among those which may be considered good prospects for all-year-round service.

However, cost is generally an important factor in water heating in the majority of these large buildings, because they are operated primarily for profit, and the comfort and convenience of the owner are not usually a factor. A janitor, fireman, or engineer is necessary for the operation of the building, and occasional attention on his part to the coal or oil fired water heater furnishes the building with fairly good hot water service.

Because the use of gas in these buildings will not usually permit any reduction in labour incidental to the operation of the building, the usual collateral advantages of gas, such as cleanliness, no fuel storage, no ashes to haul, continuous and uniform service, are not so apparent, and, therefore, gas must compete almost on the basis of actual fuel cost alone.

PRELIMINARY SURVEY.

The first step in formulating a promotional programme in the field of volume water heating should be a preliminary survey directed towards the collection of the following information:

(1) The total volume of business available, preferably sub-divided between classes of buildings. (This subdivision by classes is recommended because it will probably be found that gas can be sold at a higher price to some of these.)

(2) The kind of equipment and fuel now used.

(3) The present over-all cost of operation, sub-divided where possible between classes of building and classes of equipment.

(4) The possibility and advisability of converting existing equipment to gas by the use of conversion burner equipment.

(5) The rate required to take on the business in the various classes of buildings.

The extent and comprehensiveness of such a survey will be determined to a large extent by the size of the community and the number of buildings requiring this class of service. In the smaller community, such a survey can be made in fairly complete detail without much trouble. In the larger communities, a carefully selected cross-sectional analysis will provide fairly accurate information on which to base a promotional campaign.

After all this information has been obtained, correlated, and analyzed, it will be possible to plot a curve showing the volume of business to be obtained at various rates. Certain percentages of the business will be found to be available at relatively high rates. On the other hand, other and probably larger percentages will require much lower rates because of the types and sizes of buildings, the inability to take advantage of labour saving, or the very low priced fuel with which it is necessary to compete.

The rate which is finally set up for this class of business will be governed primarily by the volume of business that you wish to obtain. The higher the price, the less business you will get; and the lower the price, the smaller the margin of profit. It should be possible, however, to set up a rate low enough to obtain a fair percentage of the business and still show a profit over actual out-of-pocket expense.

ORGANIZATION.

The organization of an office and sales force designed to carry on an aggressive sales campaign in the field of volume water heating should be constituted along the lines of a well-organized industrial gas sales department. The nature of the work requires in most instances sound engineering and technical knowledge, because the owners and operators of buildings will have to be approached on much the same basis as the manager or owner of an industrial plant. Predicated on (say) one thousand buildings a well-balanced organization might well be as follows:

Office.	*Field.*
Manager	Supervisor
Student Engineer	Engineer
Clerk	8 to 10 Sales Engineers

Sales Engineer.—The salesmen used for this purpose should be at least High School graduates, and preferably have completed a four-year University course in mechanical engineering. Their duties are to contact the owner or operator of the building; to make a complete survey of the building, including sketches of the location and nature of the existing water-heating equipment, so that an accurate estimate of the size, type, and cost of gas equipment and an estimate of the cost of operation may be made.

It is preferable that these salesmen are not required to make any of the actual calculations either as to size, cost, or operation cost of the gas equipment; in fact, that they will be relieved of as much work of this kind as possible, in order that they may devote their major effort toward the actual contacting of the prospect and the final sale of the equipment.

Engineer.—The duties of the engineer are to check the surveys made by the salesmen, to make a further examination of the premises where additional information is necessary, and to note on the report any peculiar conditions of operations that may now exist, any changes that may be necessary due to the installation of gas equipment, and to set a figure covering the actual cost of the labour involved in the installation of gas equipment. The engineer will supervise the installation and operation of new equipment, and see to it that each installation is followed through to a successful conclusion.

Supervisor.—The duties of the supervisor are obvious, and need no extended explanation here. He is, of course, in complete charge of the outside activities of the engineer and salesmen, and is responsible to the manager of the division, to the extent that the activities of these men are properly directed, their time fully occupied, and their prospects and surveys consistently and intelligently followed up and closed.

It will probably be well worth while to equip the field supervisor with an automobile for transportation. This, however, will be governed to a large extent by the size and nature of the territory he is required to cover.

Student Engineer.—The duties of this man are to receive the surveys after they have been checked by the field engineer, to calculate, from the information contained therein, the maximum amount of hot water required, and with these data to size and price the equipment necessary for the job; to submit the surveys to the manager for his approval, after which they are referred back to the field salesmen for submission to the prospect.

The student engineer also contacts customers coming into the office, and estimates plans for new construction

* American Gas Association, Eastern Natural Gas Regional Sales Conference, Pittsburgh, Feb. 27, 1931.

that may be brought in from time to time by either architects or builders in person, or by the men in the division contacting architects and builders.

Clerk.—This man should be used to maintain a card index or file record of the buildings in a territory, to handle such other permanent records as may be kept of surveys completed or pending, and to maintain in connection therewith a follow-up file to guide the activities of the field salesmen. His duties should also include the handling of prospects, the recording of contracts closed, and the checking and routing of orders as they come into the office.

Office Records.

Building File.—A card index of all buildings is an essential part of the office equipment, and should indicate at least the following data: The name of the building; street address of building; kind and size of building (office, apartment, &c.); name and address of owner.

If a file of this kind consists of a visible card index, it can be arranged to show much other information of great value to the manager; such as fuel used, consumption to be gained, rate required, date of call back, &c.

In most of the larger communities, accurate information is available as to the address and ownership of buildings, and it will usually be found that there are various agencies willing to furnish such data and to supply a monthly maintenance service in connection therewith. Preliminary information of this kind can, of course, be obtained by a survey, and in the less congested areas this will be the logical way of obtaining it.

Survey Record.—This will comprise the major office record, and should show in detail all of the data and information pertaining to each building, such data being obtained by actual building inspection or in the case of new construction from the architect's plans and specifications.

This survey record will show not only the essential information relative to the characteristics of the building, type, size, and kind of water-heating equipment, fuel used, &c., but will also show all calculations and estimates for the gas equipment necessary, together with estimated consumption and cost of operation.

It may also contain a permanent record of the equipment sold, date of sale, by whom installed, &c. Space on a record of this kind can also carry a transcript of the monthly consumption, and a brief record of the salesman's calls prior to the actual consummation of the sale. In other words, it is a permanent record of each building, that can be referred to at any time, so that the case can be handled or re-opened by any salesman regardless of the fact that the man making the original contact may be no longer available.

Sales Contacts.

Building Owner, Manager, or Operator.—In a preliminary interview with the building owner or operator, it is suggested that the salesman's effort be directed to arousing the prospect's interest in the general subject of water heating with gas, with the object of obtaining his permission and co-operation in making a complete survey of the building. The actual sales talk should come later, when the salesman is in possession of the data covering the hot water requirements of the building, cost of installation, operation, &c.

It is important to remember that the prospect operating a building is not in business for his health, and, therefore, not very much interested in changing from one fuel to another just for the fun of doing so. He will be tremendously interested, however, in anything that will directly or indirectly increase the return on his investment.

Except in office and similar commercial buildings, it will be difficult to capitalize on the item of labour saving. However, even though actual man-power cannot be reduced, the suggestion that the janitor or fireman will have more time to spend on the more necessary items of building maintenance may fall on sympathetic ears.

Tenant turnover is a thorn in the side of most building owners, and an important item affecting the net return on his investment. Constant, uniform hot water service is certainly a factor affecting tenant satisfaction, and one that should be emphasized by the salesman.

Then, too, particularly in buildings where the central heating plant is used to furnish hot water service in the summer, it will generally be found that the apartments or other space adjacent to or above the boiler room is impossible to rent or must be rented at a reduced price because of uncomfortable temperatures. The increased rental to be derived from such space will frequently go a long way toward paying the gas bill.

Photographs and operating data of the more successful installations are valuable aids in intercsting new prospects. Charts showing the fluctuation in temperature with crude fuel operation, and vice versa, the extreme uniformity when gas is used, should also be a part of the salesman's equipment. Tables of comparative costs at normal operating efficiencies for various fuels will be of great assistance.

Architects and Engineers.—New construction offers the best source of prospect for the sale of gas equipment for water heating, and the architect and engineer should be carefully and constantly contacted. They should be kept informed on the development of gas equipment, methods of installation, rates, and operating costs—in fact, any and all technical data pertaining to the subject should be placed in their hands. The sales engineer should endeavour to cultivate these contacts consistently, as once they are sold on the economic advantages of gas for volume water heating, it will be relatively easy to have suitable equipment specified.

In our own case, the American Gas Association handbook, "Water Heating," among other technical and informative literature, has been placed in the hands of every important architect and engineer, and has proved of material assistance in having gas equipment specified.

Plumbers and Steamfitters.—These contacts are in the opinion of the writer secondary only to those made with the architect or engineer, and much of the literature and data intended for the architect will be equally effective in the hands of the plumber and steamfitter. A somewhat different technique is necessary in approaching these dealers, as it is of prime importance they be shown that the sale and installation of gas equipment are not only activities that will reflect to their credit, and thereby increase their business, but also that such sales will be profitable.

A sincere effort on the part of the utility to co-operate in the matter of discounts on sales and commissions on prospects, particularly with those contractors who ordinarily are specializing on large buildings, will be well worth while and result in valuable and advantageous sales outlets.

Advertising.

Newspapers.—It is suggested that only a relatively small part of the advertising appropriation for volume water heating be spent in the daily papers, because the number of prospects in any community, although representing a very substantial volume of consumption, are relatively small in actual numbers, and newspaper space therefore too expensive a medium for this purpose.

Direct Mail.—This form of advertising should show good results. Little difficulty should be encountered in maintaining an up-to-date mailing list, and a carefully and well-designed mailing piece sent out to this list once a month should materially increase the number of prospects and produce a sympathetic hearing when the salesman calls. Mail of this kind might well consist of reproductions of buildings and equipment where gas installations have been made, with pertinent data on operating cost, &c. It is believed that advertising of this kind should be in the general form of a business letter, rather than the more usual broadside.

Trade Papers.—It is probable that in most communities there is at least one journal whose subscription list is made up primarily of the real estate operator, building owner, &c. These publications, together with that of the local Chamber of Commerce, are logical media for advertising on volume water heating.

Prospects.

It may truthfully be said that any building is a prospect. However, an initial effort will show larger returns if some concerted effort is directed in buildings that experience has shown to be more susceptible to quick results. Some of these are as follows:

(1) New Construction: It is far easier to have gas equipment specified and installed before the building is put in service than to replace other equipment after the building is completed.

(2) Buildings in which the central heating plant is operated in the summer for the sole purpose of water heating. Uncomfortable temperatures in space adjacent to boiler room result in vacancies or low rentals.

(3) Buildings having poor hot water service, due to inadequate or faulty equipment.

(4) Old buildings where the present equipment has deteriorated to a point that replacement is necessary.

(5) Co-operative apartment buildings, and buildings where the owner is the janitor or fireman. Here personal comfort and convenience are directly involved.

(6) Office Buildings: The item of labour saving will frequently have an important bearing and may pay a substantial part of the gas bill.

Municipal Gas Undertakings' Results in 1930-31

ABERTILLERY.

The annual report states the total income for the year ended March 31 last was £22,969, and the expenditure £18,221, leaving a gross profit of £4748. Gas sold has increased by 4,370,000 c.ft., 6·43 p.ct. The consumption of gas through prepayment meters is 69·7 p.ct. The outstanding debt on the undertaking has been reduced to £16,024, and during the year the price of gas was reduced. The Gas Committee congratulated Mr. I. G. Jenkins, the Engineer and Manager, on the very satisfactory position of the undertaking.

COALVILLE.

In his annual report to the Coalville Urban Council concerning the gas undertaking, Mr. J. W. Eagles, the Manager, states that the quantity of gas made, 50,017,000 c.ft., was an increase on the previous year's output by 1,387,000 c.ft. During the year expenditure on capital account paid out of revenue totalled £1306.

COVENTRY.

A summary of the accounts of the Coventry Corporation gas undertaking for the year ended March 31 last shows that there was a profit on working of £83,419, compared with £92,297 in the previous year. Capital charges increased by £4396; but owing to the operation of the Consolidated Loans Fund, there was a reduction of interest on loans. The final result is a loss on the year of £7350. Towards meeting this there is available a balance of £2173, brought forward from 1929-30, and £1959 transferred from the Bedworth Gas Company's accounts. The deficiency is thus reduced to £3218. The sum of £166,176 was borrowed in the year, chiefly in respect of ring main, and general extensions of mains and services, while £105,268 was spent on capital account, principally in connection with the waterless gasholder, the ring main, the Bedworth connecting main, and new mains and services. The Bedworth Gas Undertaking was taken over in April, 1930, at the price of £9000.

LURGAN.

The annual report of the Gas Undertaking shows the total income from the sale of gas, residuals, &c., to be £18,480, as compared with £18,408 for the preceding year, an increase of £72. The working profit amounted to £6106, as compared with £5812—an increase of £294. The net profit was £1040, as against £1137. The cost of manufacturing gas per 1000 c.ft. was 4s. 11¾d., as compared with 4s. 11½d. The figure for sales was 5s. 3·72d. per 1000 c.ft., as against 5s. 3·65d. The total amount of gas consumed was 62,604,500 c.ft., of which 21,728,900 c.ft. was for ordinary meters and 40,875,600 c.ft. for slot meters, as compared with 62,101,700 c.ft. for the previous year—an increase of 502,800 c.ft.

MACCLESFIELD.

There has been an increase in the consumption of gas amounting to 46,982 therms, which is 3·06 p.ct. above last year's figures. The prepayment system now amounts to 48·8 p.ct. of the whole consumption, and shows an increase of 2·4 p.ct. above last year's consumption. The total quantity (in therms) of gas sold during the year was: Ordinary, 725,362; prepayment, 773,180; public lamps, 70,452; a total of 1,568,994. The average price received for all gas supplied amounts to 6·002d. per therm net. The unaccounted-for gas was 4·83 p.ct. The maximum and minimum deliveries of gas during 24 hours were 6442·8 therms and 2112·6 therms respectively. The number of cookers, gas fires, radiators, boilers, &c., sold or let out on hire purchase during the year was 710, against 774 last year. During the year 205 new service pipes were laid and new meters fixed; the total number of meters in use at the end of the year being 10,695, an increase of 93 on the previous year.

PADIHAM.

The gas sold decreased to 117,216,488 c.ft., this being 4·14 p.ct. less than the previous year. This decrease is chiefly accounted for by the reduction in mill consumptions, which decreased to 4,682,500 c.ft., a decrease of 45 p.ct. as compared with last year. The total revenue from the business done through the showroom and private fitting work was £2230, compared with £2692 last year. The expenditure on fittings, wages, rent, gas, rates, &c., being £2130, giving a net profit on this section of £99, against £286 last year. The revenue expenditure and income during the year were £23,872 and £30,178 respectively, leaving a gross profit of £6305, equal to 19·8 p.ct. on the Department's outstanding debt. Interest on loans and sinking fund contributions absorb £5223, leaving a net profit of £1082, as compared with £2136 last year. The amount in reserve fund is now £6305, as compared with £6563 at March 31 last year.

ROTHERHAM.

The period has been a record one, the output of gas amounting to 695,011,100 c.ft., as compared with 627,835,000 c.ft. last year. This is an increase of 10·7 p.ct. The gross profit for the year amounts to £31,674; and after deducting £15,736 for interest and redemption of debt and £5152 for income-tax, there is a net profit of £10,786. This sum is reduced by £3774, the cost of gas for public lighting in the Borough, which is given free, leaving a balance of £7012 to be carried forward. The new carburetted water gas plant was completed in July, 1930, and satisfactory tests by the contractors were carried out. The plant is now ready for gas making in case of emergency, and to augment the supplies of coke oven gas in the event of partial failure to supply by the coke ovens. During the year a boosting plant was installed to enable greater use to be made of the gasholders, and a new meter for the measurement of coke oven gas from the Rotherham Main Ovens has been put into operation. The Department is responsible for the illumination of 45 miles of streets in the Borough and 50 miles of streets in the out-districts. The lighting is effected by 1380 low-pressure and 53 high-pressure street and public lamps in the Borough, which have been lighted for 3676 hours during the year. There are, in addition, 460 low-pressure lamps in the out-districts.

SMETHWICK.

Presenting the report on the Gas Undertaking, Alderman Pinkney referred to the net profit, amounting to £6808. On an analysis of the comparative figures given in the report, he said that the balance-sheet was comparable with that of the preceding year, when the net profit was £10,000. During the year there had been many things that had made against the greater success of the Undertaking. The severe trade depression had seriously affected the consumption of gas, which showed a decrease of 53 million c.ft., or 5·95 p.ct., as compared with last year. The reduction was solely attributable to the decreased demand made by manufacturers for industrial purposes. That was a thing over which they had no control. The increased cost of coal, amounting to £1214, had been practically wiped out by the increased yield in gas per ton, which accounted for a saving of 1003 tons of coal, equal in value to £1182. A reduction in the amount of gas lost by leakage and other causes further accounted for a saving of £678, and it was interesting to place on record the amount of gas unaccounted for (2·02 p.ct.) as now one of the lowest, and the amount of gas sold per ton of coal carbonized as now approaching the highest in the country.

[This paragraph was inadvertently inserted under the heading of "Hereford" in last week's issue. The results of the Hereford Undertaking have not yet been presented.]

SOUTHPORT.

During the year the gas consumed in the Southport area of supply amounted to 799,598,600 c.ft.—22·98 p.ct. of this total being supplied through prepayment meters. As compared with last year there was a reduction of twelve consumers taking gas through the ordinary meters, and an increase of 525 prepayment customers. The average price received for all gas amounted to 7·82d. per therm net, which is equivalent to 3s. 0·76d. per 1000 c.ft. The total capital outlay of the gas estate was £608,617, and the net capital indebtedness at March 31 was £262,988. The gross profit of the estate for the year amounted to £51,844, and after paying interest and sinking fund, income-tax, &c., amounting to £39,387, there remains a net profit of £12,456. Adding to this the balance of £5394 brought forward from last year, the total amount at the credit of the appropriation account is £17,850. Of this amount it is proposed to transfer in aid of rates, £2475; revenue contribution to capital, new meters, £3328; and for the re-construction of the vertical retorts, £6469; leaving a balance of £5579 to be carried forward to next year's account. During the year prices obtained for residual products were: Coke, £18,693, increase £897; tar, £5343, decrease £956; concentrated ammonia, decrease £402. Although there has been an increase in the sale of coke, residual products show a net decrease of £461. The total amount of gas sold during the year was 552,602,800 c.ft. through ordinary meters, 183,823,500 c.ft. through prepayment meters, 62,850,700 c.ft. in public lamps, 32,800 c.ft. through private lamps, giving a total of 799,309,800 c.ft., which is a decrease of 144,900 c.ft. on last year.

WALSALL.

The report of the Gas Committee of the Walsall Town Council shows a net profit of £19,207, against £9622 in the previous year. This profit is the best since 1920. Commenting on the undertaking Mr. Ralphs (the Borough Treasurer) points out that the gross profit was £53,459, compared with £53,562 in the previous year. On the expenditure side, the manufacture of gas cost £834 less; distribution, £197 less; residuals, £970 less; and rents and rates, £1054 less; but public lamps, gas fittings, &c., management and other items show increases amounting to £1785. The income from the sale of gas was £2873 more, and there was a further increase in the net receipts from the sale of hire-purchase apparatus. Of the amount of £53,459 carried to the net revenue account, £16,756 was required to meet interest charges, and £14,444 for the redemption of debt, and the net charge for income-tax was £4175. The main feature of the balance-sheet was the improvement in the financial position of the Department during the last twelve months. The debit balance on the appropriation account has been reduced from £17,624 to £5796.

REGISTER OF PATENTS

Catalytic Dehydrogenation of Hydrocarbons. No. 349,444.

GAS LIGHT AND COKE COMPANY and GRIFFITH, R. H., both of Westminster, S.W. 1.

No. 2650; Jan. 25, 1930.

Hydrocarbon oils or gases may be made to decompose rapidly by subjecting them to heat at an elevated temperature (for example, a temperature above 400° C.) in the presence of a catalyst, with or without also the presence of added gases. The nature of the change which occurs is largely defined by the conditions of operation, and may lead to the production of large volumes of hydrogen, methane, or other hydrocarbon gases; or to the formation of condensed, cracked, or polymerized liquid and solid hydrocarbons. High temperatures and low pressures favour the former type of reaction while lower temperatures and high pressures encourage the latter. It is possible, for example, to increase the amount of aromatic hydrocarbons in an oil by treating it in this way.

In such reactions titanium, chromium, and tungsten, or compounds of these metals, associated with closely defined amounts of certain inorganic promoter substances, are effective catalysers. Such reactions may be markedly accelerated if carried out with the aid of a catalyst consisting of titanium or a suitable compound thereof in the presence of a promoter consisting of zinc, or aluminium, or manganese, or chromium, or a suitable compound or compounds of any one or more of these promoter-elements, the atomic ratio of promoter-element to titanium being 1—6 : 100.

In the case where chromium or a suitable compound thereof is the catalyst, the promoter consists of tin, or boron, or cerium, or manganese, or a suitable compound or compounds of any one or more of these promoter-elements, and the atomic rate of the promoter-element to chromium is 16—20 : 100.

Where tungsten or a suitable compound thereof is the catalyst employed, the promoter consists of a chromium, or molybdenum, or uranium, or copper, or cadmium, or a suitable compound or compounds of any one or more of these promoter-elements, and the atomic ratio of promoter-element to tungsten is 2—7 : 100.

The promoter substances, if employed in proportions relatively to the catalysts other than the proportions stated, may act as a deterrent upon the catalyst.

Hydrogenation.—No. 349,991.

GAS LIGHT AND COKE COMPANY and GRIFFITH, R. H., both of Westminster, S.W. 1.

No. 2649; Jan. 25, 1930. No. 7639; March 8, 1930.
No. 10,068; March 29, 1930.

This invention relates to the conversion of hydrocarbons having a high-boiling point, such as coal-tars, into hydrocarbons having a lower boiling-point, by treatment of the starting material with hydrogen at an elevated temperature and pressure in the presence of a catalyst.

Within the range of possible molybdenum-promoter ratios there is a small critical range (a peak-ratio range) which, if selected, will give a materially higher promotive effect than other ratios.

According to the invention, a process of the type referred to for the destructive hydrogenation of high-boiling hydrocarbons, is characterized by the selection and use of a ratio of promoter to molybdenum which is within the peak-ratio range.

The molybdenum catalyst may be promoted by two or more promoter elements, or their compounds, used together. In this event, the relative proportions employed of the two or more promoters should be an appropriate compound of the proportions that would be requisite if the promoters in question were used alone with the molybdenum. For example, if one-half of the optimum proportion of lithium be employed—namely, a proportion in which the atomic ratio of molybdenum to lithium is about 100 : 3·55, then, as at the optimum proportions the activities of lithium and phosphorus are approximately the same, an amount of phosphorus should be employed such that the atomic ratio of molybdenum to phosphorus in the mixture of molybdenum, lithium, and phosphorus, is about 100 : 2·1.

The invention is described with reference to several examples of the process, which are given by way of illustration.

EXAMPLE I.

200 parts of a low-temperature tar, topped to 200° C., are heated with hydrogen for one hour under a pressure of 200 atmospheres and at a temperature of 440° C. in the presence of 10 parts of a catalyst consisting of a homogeneous mixture of molybdic acid and silica in the atomic ratio, molybdenum to silicon, of 100 : 8.

The product comprised about 24 parts of water and about 113 parts of oil, of which 48·5 p.ct. boiled below 180° C. The parts stated are by weight.

EXAMPLE II.

The same tar was treated under the same conditions of temperature, pressure, and quantities, but with a molybdic acid-silica catalyst in which the atomic ratio of molybdenum to silicon was 100 : 5·4. The product comprised 24 parts of water and approximately 120 parts of oil, 49 p.ct. of which boiled below 180° C.

EXAMPLE III.

200 parts of a low-temperature tar, topped to 200° C., were heated with hydrogen for one hour at 440° C. and under a pressure of 200 atmospheres in the presence of 10 parts of a molybdic acid-boric acid catalyst in which the atomic ratio of molybdenum to boron was 100 : 8·7. The product comprised 20 parts of water and approximately 111 parts of oil, of which 51 p.ct. boiled below 180° C.

Seal for Waterless Holders.—No. 349,697.

MASCHINENFABRIK AUGSBURG-NURNBERG AKTIENGESELLSCHAFT, of Nürnberg.

No. 9630; March 26, 1930. Convention date, April 17, 1929.

The following claims are made for this invention:

1. In a waterless gasholder the use as a seal of a coal tar oil distillation product having a specific gravity of about 1·1, being free from distillation residue containing pitch or dust, and consisting exclusively of fractions of the coal tar which boil at over 250° C., which fractions are freed from naphthalene and crude anthracene and do not contain any phenols, and are mixed in such proportions that its viscosity is between 1·8 and 3·5 Engler degrees (at 50° C.).

2. In a waterless gasholder the use of a liquid seal according to claim 1 characterized by the feature that, in order to increase the viscosity and reduce the vapour tension, use is made of fractions which boil only above 300° C.

3. In a waterless gasholder the use of a liquid seal according to claim 1, characterized by the feature that, in order to increase the viscosity and decrease the vapour tension, the content of the fractions boiling between 400° and 450° C. is increased to double the normal content (to about 30 p.ct.) by the admixture of fractions having the highest boiling-point and free from crude anthracene.

No. 349,698.

No. 9631; March 26, 1930. Convention date, June 15, 1929.

A pure coal tar distillate is used as the sealing means for waterless holders, which distillate is obtained according to the following processes:

1. Distilling the crude tar and removal of the fractions distilled at from 210° to 450° C. for further use.
2. Separation of the anthracene from the distillate by supercooling and filtration for several days.
3. Further distillation of the oil filtrate.

The invention lies in the utilization of the idea that distillates produced in this manner have unique properties as regards the specific gravity, viscosity, setting-point, freedom from certain admixtures, capability of emulsion with water, &c., which render them suitable as a sealing means.

Gasholders.—No. 350,289.

ASHMORE, BENSON, PEASE, & CO., LTD., RAMBUSH, N. E., and PICKLES, H. J., all of Stockton-on-Tees.

No. 21,225; July 14, 1930.

A series of rigid pipes is provided leading from individual guide means for the movable parts and the exterior of the holder, for the conveyance of lubricant to the guide means, which latter are wholly independent of the packing between individual lifts.

One or more pipes, tubes, or ducts within the chamber communicate at one end with the guiding members, usually rollers, movable with the lifts, and at their other ends pass through or are adjacent to the walls of the respective lifts or at accessible points thereon.

A plurality of pipes communicating at one end with guiding members of one lift may be connected at their other ends to a common pipe or duct passing through the wall of the lift. Fluid-tight packing means are preferably provided at the point where a pipe passes through a wall of the holder, and if desired such packing means may also be provided adjacent the exit end of a pipe adjacent the guide which it lubricates. The pipes may be employed as pressure pipes, and may be fed by means of a grease gun through a nipple at the inlet end or by means of an oil pump.

Alternatively, the pipes may be used for leading purposes only, a forced lubricator, self-oiler, or the like being provided between the pipe and the guiding part to be lubricated. The inlet end of a pipe is located in an accessible position so that oil or grease can be supplied thereto by a workman or attendant although the holder may be wholly or partly in commission. With the assurance that the rollers are properly lubricated fewer rollers may be used than formerly.

Gas Meters.—No. 348,219.

WEST, A. J., and the GAS METER COMPANY, LTD., both of 238, Kingsland Road, E. 2.

No. 5156; Feb. 15, 1930.

This invention relates to gas meters, and has for its object to provide simplified means for enabling the meter to be operated as a prepayment meter by coins of different dimensions, and, if desired, to be operated as an ordinary meter without prepayment.

The patentees point out that, in a previous specification, mechanism is described whereby analogous results are sought, but the angular movement of the metering shaft renders impractical the provision of a gland for this shaft where it traverses the casing of the meter proper. The upper portion of the meter casing cannot therefore be rendered gas tight, as is desirable in some circumstances.

This difficulty is removed by this invention, since no angular movement of the shaft is involved. The invention consists briefly in a gas meter including a pair of toothed wheels rotationally rigid with a measuring-out spindle, a worm rotationally rigid with, but axially slidable upon, a shaft driven by the metering mechanism, and means enabling the work to be brought into driving relationship either with one of the pair of toothed wheels by way of reduction gearing, or with the other of the pair of toothed wheels indirectly.

Gas Meters.—No. 348,288.

THOMAS GLOVER & CO., LTD., and WILSON, J. S., both of Edmonton, N. 18.

No. 8544; March 17, 1930.

The object of this invention is to provide improved means between the coin operating mechanism of a gas meter and the bellows mechanism whereby a gas valve may be quickly opened by the coin operating mechanism and slowly closed by the bellows mechanism.

The appliances consist of a shaft held in bearings of a frame and connected at one end with the coin-freed actuating mechanism. It has a screw thread cut in a portion of its length at the other end, and carries at the screw thread end a stop which revolves with it. Surrounding the shaft at the plain portion is a tube having at one end a gear wheel meshing with a worm operable from the bellows mechanism and positioned in bearings at right angles to the sleeve, such tube having a groove along its length. This tube is held in position by a birfurcated stop, such bifurcated stop engaging the tube and acting against the gear wheel.

Surrounding this grooved tube is a sleeve having on its outside a series of ring teeth. Inside this sleeve at one end is a screw thread engaging the screw thread on the rod or shaft, and at the same end on the outside in a groove engaged by the bifurcations of a member slidably positioned on a stem projecting from the frame. This member carries a pin capable of being passed through a hole in the frame for being acted upon by the stop at the end of the shaft, the bifurcated member travelling with the ring-toothed sleeve. The other end of the sleeve carries a pin normally projecting in the groove of this tube and preventing the sleeve revolving on the tube.

Meshing with the ring toothed sleeve is a toothed pinion or quadrant carried by a spindle positioned in a suitable stuffing box on the frame and carrying an arm having the valve, such toothed wheel or quadrant having a pin acting against a spring on the frame.

In action, and supposing the valve be closed with the pin on the valve wheel or quadrant slightly compressing the spring, on insertion of a coin the coin mechanism, which may be of any construction, is actuated; and this in turn revolves the shaft, the screw thread on the shaft will quickly move the ring toothed sleeve along same and the tube, the tube remaining stationary and the sleeve not revolving by means of its pin engaging in the groove of the tube and the gear wheel on the end of the tube being locked by the worm actuatable by the bellows mechanism.

On the bellows mechanism functioning, the worm is revolved slowly, and, actuating the gear wheel on the tube, will cause the tube to revolve, and, by the pin on the sleeve in its groove, will revolve the sleeve. Through the screw thread inside the sleeve coating with the screw thread on the shaft which is held by the coin operated mechanism, the sleeve and tube will move along the shaft in the reverse direction, and the ring teeth of the sleeve will act upon the gear wheel or quadrant on the valve spindle and close the valve compressing the spring.

The gear wheel on the tube and the worm on the shaft actuated by the bellows mechanism are in ratio to suit the quantity of gas to be supplied for the value of the coin inserted.

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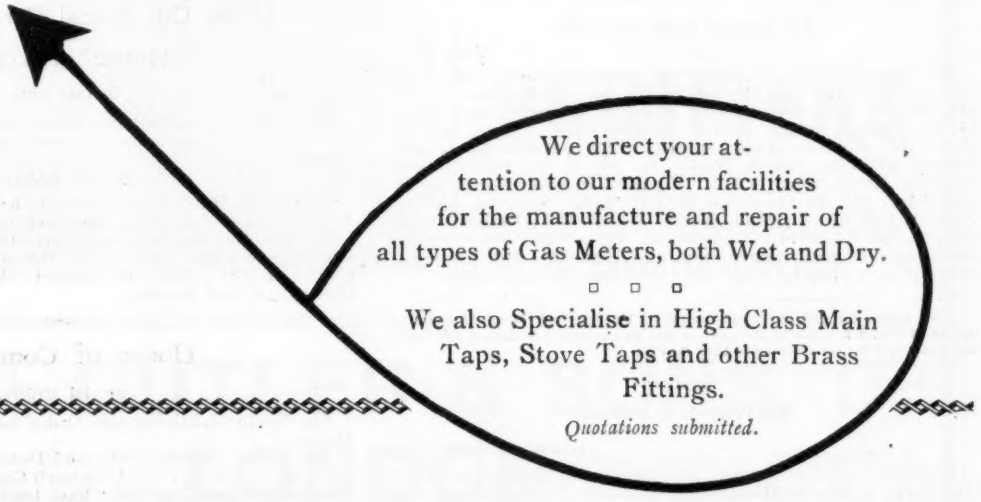
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GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

The disappointment at the result of the Seven-Power Conference, coupled with a rise in the Bank Rate from 2½ p.ct. (at which figure it has stood since May 14 last) to 3½ p.ct., with the prospect of perhaps a further increase in the near future, were disturbing influences last week, and it was only to be expected that business on the Stock Exchange was on a small scale with prices in many sections registering falls. At the close on Friday, however, a more cheerful sentiment developed, and some fairly sharp rises took place in the gilt-edged section.

Business in the Gas Market, however, was a trifle heavier than the previous week, and prices, being unaffected by outside influences, remained very steady. It will be seen from the Stock and Share List that the ordinary stocks of the three Metropolitan Companies and the Bristol Company have been marked *ex* div., and, apart from reductions on this account, the only falls of any consequence occurred in Imperial Continental ordinary and Metropolitan (of Melbourne) 5½ p.ct. debenture, both stocks declining 5 points. On the other hand, a sharp rise of 7½d. took place in Newcastle £1 units (at Newcastle) to 17s. 7½d., and Maidstone ordinary advanced 2 points to 130-135.

The ordinary stock of the Uxbridge, Maidenhead, and Wycombe Company is an attractive investment at the present low price of 104½. The Company has distributed in dividends for 1926, 6½ p.ct.; 1927, £6 11s. 3d. p.ct.; 1928, £6 18s. 9d. p.ct.; and for 1929 and 1930, 7 p.ct. On this latter basis, the yield afforded is the high one of £6 14s. p.ct. Though the current price is 8 points higher than a year ago, it is still somewhat undervalued; but the stock is not always readily obtainable, and, as is the case with many other gas issues, this fact is largely responsible for the low price.

The following ordinary dividend announcements were made last week, and all are at the same rates as a year ago—viz., Cardiff, 3 p.ct.; Commercial, 3 p.ct.; Gas Light and Coke, £2 16s. p.ct.; and South Metropolitan, the usual interim dividend of 2½ p.ct.

Current Sales of Gas Products.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *July* 27.

The prices for tar products to-day are as follows:

Pitch is firm at 50s. per ton f.o.b.

Creosote, for export, varies from 3¾d. to 5d. per gallon f.o.b., according to specification.

Pure toluole is 1s. 10d. to 1s. 11d. per gallon; pure benzole, about 1s. 4d. per gallon; and 95/160 solvent naphtha, about 1s. 4d. per gallon, in bulk *ex* sellers works.

Pyridine bases, 3s. to 3s. 3d. per gallon.

Tar Products in the Provinces.

July 27.

The average prices of gas-works products during the week were: Gas-works tar, 17s. 6d. to 21s. 6d. Pitch—East Coast, 47s. 6d. to 50s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 47s. 6d. to 50s. f.o.b.* Toluole, naked, North, 1s. 7d. to 1s. 7¼d. Coal-tar crude naphtha, in bulk, North, 5d. to 5¼d. Solvent naphtha, naked, North, 1s. 2d. to 1s. 2¼d. Heavy naphtha, North, 10½d. to 11d. Creosote, in bulk, North, liquid and salty, 3¼d. to 3½d.; low gravity, 1¼d.; Scotland, 3¼d. to 3½d. Heavy oils, in bulk, North, 5d. to 5½d. Carbolic acid, 60's, 1s. 3d. to 1s. 4d. Naphthalene, £9 to £10. Salts, 50s. to 70s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port, it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *July* 25.

Conditions have been very quiet here owing to local holidays, but works resume on Monday and Tuesday. Values remain easy in most departments.

Pitch.—Current export value is 40s. per ton f.o.b. Glasgow, with forward offers from 42s. 6d. to 45s. per ton. Home trade is dull at 35s. to 37s. 6d. per ton *ex* works.

Refined tar to Ministry of Transport Specification.—Quotations are unchanged at 2¼d. to 2¾d. per gallon f.o.r. makers' works.

Creosote oil.—Prices are steady. B.E.S.A. Specification is 2¾d. to 3d. per gallon; low gravity, 3¼d. to 3¾d. per gallon; and neutral oil, 3¼d. to 3½d. per gallon—all f.o.r. in bulk quantities.

Cresylic.—Few inquiries are in circulation. Pale, 97/99 p.ct., is 1s. 3d. to 1s. 4d. per gallon; dark, 97/99 p.ct., 1s. 2d. to 1s. 3d. per gallon; and pale, 99/100 p.ct., 1s. 5d. to 1s. 6d. per gallon—all f.o.r. works.

Crude naphtha is unchanged at 4¼d. to 4¾d. per gallon, with production low.

Solvent naphtha.—Values are lower; 90/160 being 1s. 2d. to 1s. 3d. per gallon, and 90/190 11d. to 1s. per gallon.

Motor benzole.—While supplies are not too plentiful very little interest is being shown in this product. To-day's value is 1s. 2d. to 1s. 3d. per gallon f.o.r. in bulk.

Pyridines.—90/160 grade is 3s. to 3s. 3d. per gallon, and 90/140 grade 3s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole:

	s. d.		s. d.	
Crude benzole	0 5½	to	0 6½	per gallon at works
Motor ,,	1 0	,,	1 1	,, ,, ,,
Pure ,,	1 4	,,	1 5	,, ,, ,,

Trade Notes.

Fletcher Colliery Plant.

A brochure has been published by Messrs. George Fletcher & Co., Ltd., of Masson Works, Derby, describing some of the colliery work carried out by the firm. The publication is intended to convey a broad idea of the engineering capabilities of the Masson Works, and includes photographs of actual machinery manufactured by them.

New Spiral-Guided Holder for St. Austell.

Owing to increasing demands the St. Austell Gas Company, Ltd. (Cornwall), have decided on the installation of a new 125,000 c.ft. capacity gasholder of the spiral-guided type, the contract for which has been placed with Messrs. Firth Blakeley, Sons, & Co., Ltd., of Vulcan Ironworks, Church Fenton. This gasholder is to be fitted with their patent "Vulcan" ball-thrust spiral carriages.

Parliamentary Intelligence

[From Our Special Correspondents.]

House of Lords.

Private Bills.

The Sheffield Gas Bill has been returned from the Commons with the Lords amendments agreed to and now awaits Royal Assent.

Special Orders.

The North Middlesex Gas Order, having been passed by the Special Orders Committee, has been approved by the House.

The following Special Orders have been passed by the Special Orders Committee and await the approval of the House: Dudley, Brierley Hill, and District; Abergavenny; Wombwell; Cheltenham and District.

House of Commons.

Special Orders.

The North Middlesex Gas Order has been approved by the House.

The Dudley, Brierley Hill, and District Gas Order; the Abergavenny Gas Order; the Wombwell Gas Order; and the Cheltenham and District Gas Order have been approved by the House.

Plans have been deposited in connection with the Willenhall Gas Order.

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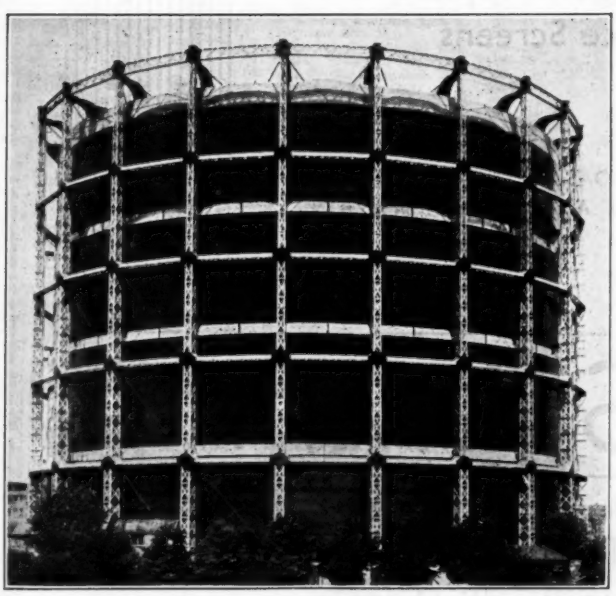

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STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. July 24.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C. ...	78—83	...	77—78
522,992	,,	,,	4	4	Do. 4 p.c. Pref. ...	75—80	...	...
1,551,868	,,	Apl. 9	7⅞	7⅞	Alliance & Dublin Ord. ...	102—107	...	105½—106½
374,000	,,	July 9	4	4	Do. 4 p.c. Deb. ...	71—76	...	...
522,655	,,	Mar. 5	7	7	Barnet Ord. 7 p.c.	124—129	...	...
300,000	1	Apl. 23	1/4½	1/9⅜	Bombay, Ltd.	16/6—18/6	...	...
174,500	10	Mar. 5	9	9	Bournemouth 5 p.c. ...	15—16	...	15⅞—16
500,050	10	,,	7	7	Do. B 7 p.c. ...	12⅜—13½	...	12⅜—13½
439,160	10	,,	6	6	Do. Pref. 6 p.c. ...	11½—11¾	...	11⅞
50,000	Stk.	June 25	3	3	Do. 3 p.c. Deb. ...	60—63	...	...
162,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	80—83	...	...
357,900	,,	Mar. 19	7½	7½	Brighton & Hove 6 p.c. Con.	112—117	...	...
371,880	,,	,,	6⅔	6⅔	Do. 5 p.c. Con.	105—108	...	106½—107⅔
1,287,500	,,	July 23	5	5	Bristol 5 p.c. max.	94½—95½[a]	−1½	...
120,420	,,	June 25	4	4	Do. 1st 4 p.c. Deb. ...	78—80[a] *	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	78—80[a]	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	98—99[a]	...	...
855,000	,,	Apl. 9	7	8	British Ord.	110—115	...	...
100,000	,,	June 25	7	7	Do. 7 p.c. Pref.	110—115	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	77—80	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	97—100	...	...
160,000	,,	June 25	5	5	Cambridge 5 p.c. Deb. ...	98—101	...	101¼
100,000	10	May 21	6	8	Cape Town, Ltd.	9—10	...	...
100,000	10	May 7	4½	4½	Do. 4½ p.c. Pref. ...	6½—7½	...	...
150,000	Stk.	June 25	4½	4½	Do. 4½ p.c. Deb. ...	72—77	...	...
626,860	,,	July 23	6	6	Cardiff Con. Ord.	95—98*	−2	...
157,150	,,	Feb. 19	5	6¼	Chester 5 p.c. Ord.	85—90[b]	...	...
98,936	1	May 7	†2/-	†2/-	Colombo, Ltd. Ord.... ...	28/—33/-	...	30/-
24,500	1	,,	1/4⅛	1/4⅛	Do. 7 p.c. Pref.	17/6—19/6	...	...
609,204	1	Apl. 9	1/4⅛	15·27[d]	Colonial Gas Assn. Ltd. Ord.	16/—18/-	...	...
296,053	1	,,	1/7½	17·67[d]	Do. 8 p.c. Pref.	17/6—19/6	...	...
2,073,280	Stk.	July 23	6	6	Commercial Ord.	92—95*	−2	...
475,000	,,	June 11	3	3	Do. 3 p.c. Deb. ...	59—62	...	...
787,560	,,	Feb. 19	7	7	Croydon sliding scale ...	110—113	...	111—111½
453,100	,,	,,	5	5	Do. max. div.	83—86	...	84
542,270	,,	Mar. 5	7	10	Derby Con.	122—125[c]	...	...
55,000	,,	June 25	4	4	Do. Deb.	65—70[c]	...	...
209,000	,,	Mar. 5	5	5	East Hull Ord. 5 p.c. ...	72—75	...	...
1,002,180	,,	Mar. 19	†4	†6⅔	European, Ltd.	82—92	...	83—90
18,953,038	,,	July 23	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	18/6—19/6[f]*	−/6	18/4½—19/6
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	65—68*	−1	...
4,294,691	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	78—81*	−2	79½—81⅝
5,694,095	,,	June 11	3	3	Do. 3 p.c. Con. Deb. ...	64—67		65
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	102—105	+1	103½
2,500,000	,,	,,	—	—	Do. 4½ p.c. Red. Deb. ...	97—100	...	98½—99½
161,480	,,	Mar. 5	10	10	Harrogate Cons. 10 p.c. max.	157—162	...	...
82,500	,,	Mar. 19	7	7	Hastings & St. L. 5 p.c. Conv.	98—103	...	...
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	82—85	...	...
70,000	10	Oct. 9	⅛	10	Hongkong & China, Ltd. ...	13—14	...	13½—13⅝
213,200	Stk.	Mar. 5	6	6	Hornsey Con. 3½ p.c. ...	91—94	...	...
2,800,000	,,	May 21	15	25	Imperial Continental Cap.	315—335	−5	314—333
223,130	,,	Feb. 5	3½	3½	Do. 3½ p.c. Red. Deb.	78—83	...	...
235,242	,,	Mar. 5	8½	8½	Lea Bridge 5 p.c. Ord. ...	127—130	...	...
2,145,907	,,	Feb. 19	6	6	Liverpool 5 p.c. Ord. ...	99½—100[b]	−¼	...
306,083	,,	July 15	4	4	Do. 4 p.c. Deb. ...	79—81[b]	...	...
165,736	,,	Feb. 19	9	9	Maidstone 5 p.c. Cap. ...	130—135	+2	133½
63,480	,,	June 25	3	3	Do. 3 p.c. Deb. ...	57—60	...	...
75,000	5	June 11	†10	†10	Malta & Mediterranean ... Metropolitan (of Melbourne)	6½—7	+⅛	...
392,000	—	Apl. 2	5½	5½	5½ p.c. Red. Deb.	80—85	−5	82½—83
675,000	Stk.	May 21	†6	†6	Montevideo, Ltd.	80—90	...	...
2,061,315	,,	Mar. 5	5	5⅔	Newcastle & Gateshead Con.	17/3—18/-[d]/	+-/7½	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	75½—76½[d]	...	...
691,705	,,	Jan. 8	3½	3½	Do. 3½ p.c. Deb. ...	69—71[d]	...	...
277,285	,,	May 7	5	5	Do. 5 p.c. Red. Deb.	98—100[d]	...	...
199,940	,,	Mar. 5	7½	7½	North Middlesex 6 p.c. Con.	115—120	...	...
396,160	,,	Feb. 5	5	5	Northampton 5 p.c. max. ...	74—79	...	...
300,000	,,	Apl. 23	9	7	Oriental, Ltd.	98—103	...	...
60,000	5	13 May, '15	—	—	Ottoman	0—¼	...	...
205,162	Stk.	June 25	8	8	Plym'th & Stonehouse 5 p.c.	110—115	...	...
424,416	,,	Feb. 19	8	8	Portsm'th Con. Stk. 4 p.c. Std.	122—127	...	125—127
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	78—81	...	...
686,312	,,	July 23	4	4	Primitiva 4 p.c. Rd. Db. 1911	83—86*	−2	...
389,813	,,	June 25	4	4	Do. 4 p.c. Cons. Deb.	84—87	...	...
150,000	10	Apl. 9	6	6	San Paulo 6 p.c. Pref. ...	8—8⅜	...	...
1,736,968	Stk.	Mar. 19	6½	6½	Sheffield Cons.	105—107[e]	...	...
95,000	,,	July 9	4	4	Do. 4 p.c. Deb.	79—81[e]	...	...
90,000	10	June 11	‡5	‡5	South African	3¾—5¼	...	...
6,709,895	Stk.	July 23	7½	5	South Met. Ord.	101½—103½*	−2	102—105½
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	112—115*	−2	113½—116½
1,895,445	,,	July 9	3	3	Do. 3 p.c. Deb. ...	62—65	...	62—62½
734,000	,,	Mar. 5	6½	6½	Do. 6½ p.c. Red. Db.	98—100	...	99½
1,000,000	,,	July 23	4	5	Do. 5 p.c. Red. Deb.	100—103*	−1	103
91,500	,,	Mar. 5	8½	8½	South Shields Con.	113—115[d]	...	...
1,543,795	,,	Feb. 19	6⅔	6⅔	South Suburban Ord. 5 p.c.	103—106	...	...
668,837	,,	June 25	5	5	Do. 5 p.c. Deb.	100—103	...	101½—103
647,740	,,	Feb. 19	5	5	Southampt'n Ord. 5 p.c. max.	78—81	...	...
121,275	,,	June 25	4	4	Do. 4 p.c. Deb.	77—80	...	...
179,014	,,	Mar. 5	8	8	Sutton Ord.	120—130	...	...
94,500	,,	June 25	5	5	Do. 5 p.c. Deb.	96—99	...	...
250,000	,,	Mar. 5	7	7	Swansea 7 p.c. Red. Pref. ...	98—101	...	...
200,000	,,	June 25	6½	6½	Do. 6½ p.c. Red. Deb.	99—102	...	...
1,076,490	,,	Mar. 5	6⅔	6⅔	Tottenham District Ord. ...	103—107	...	...
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	101—104	...	...
199,005	,,	June 11	4	4	Do. 4 p.c. Deb.	78—81	...	...
85,701	,,	Mar. 19	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	74—79	...	...
310,694	,,	Mar. 5	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	102—107	...	...
88,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	90—95	...	94½
1,322,220	,,	July 9	7	7	Wandsworth, Wimbledon, and Epsom Cons.	111—114	...	112½—113½
426,000	,,	,,	5	5	Do. 5 p.c. Pref.	97—100	...	...
1,013,464	,,	June 25	5	5	Do. 5 p.c. Deb.	100—103	...	102—103

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock. * Ex. div. † Paid free of income-tax. ‡ For year. § Div. = 10 p.ct. p.a. less tax and less tax on interim dividend.

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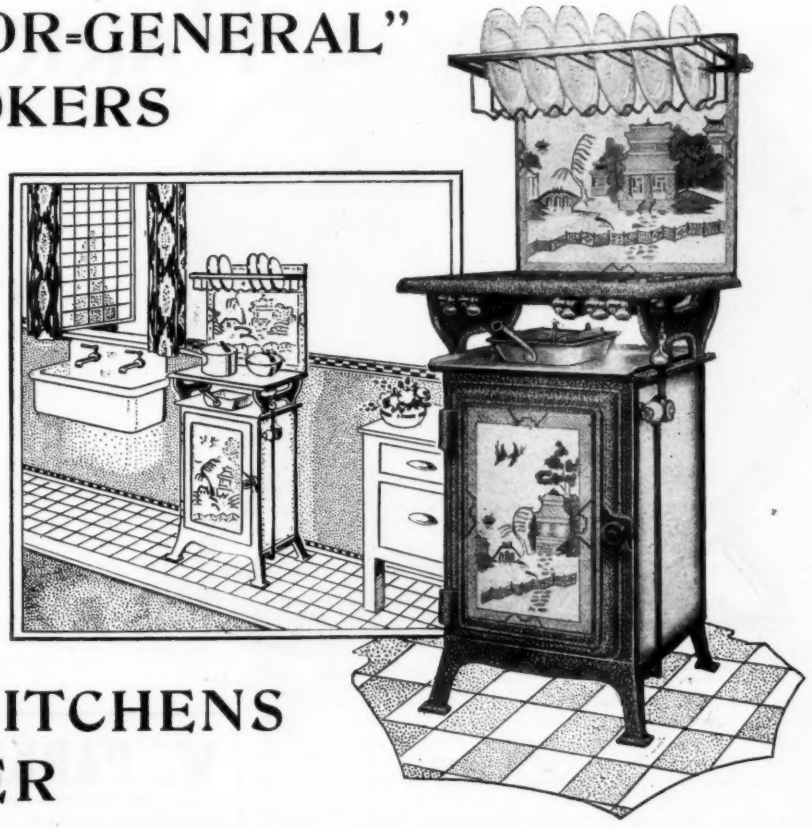

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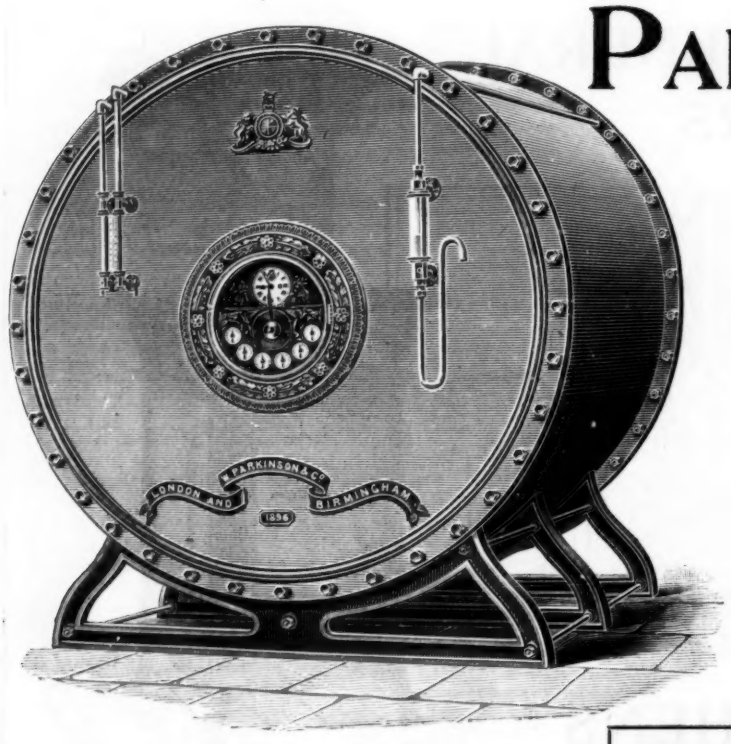

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